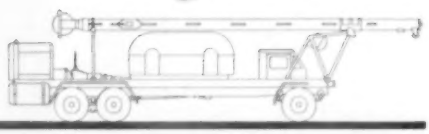
The PETROCHEMICALS ... a special section

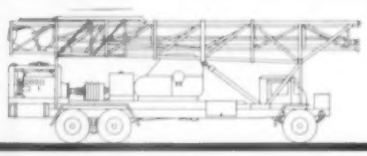
OIL AND GAS JOURNAL

NOW A **midget** FRANKS *Clipper*

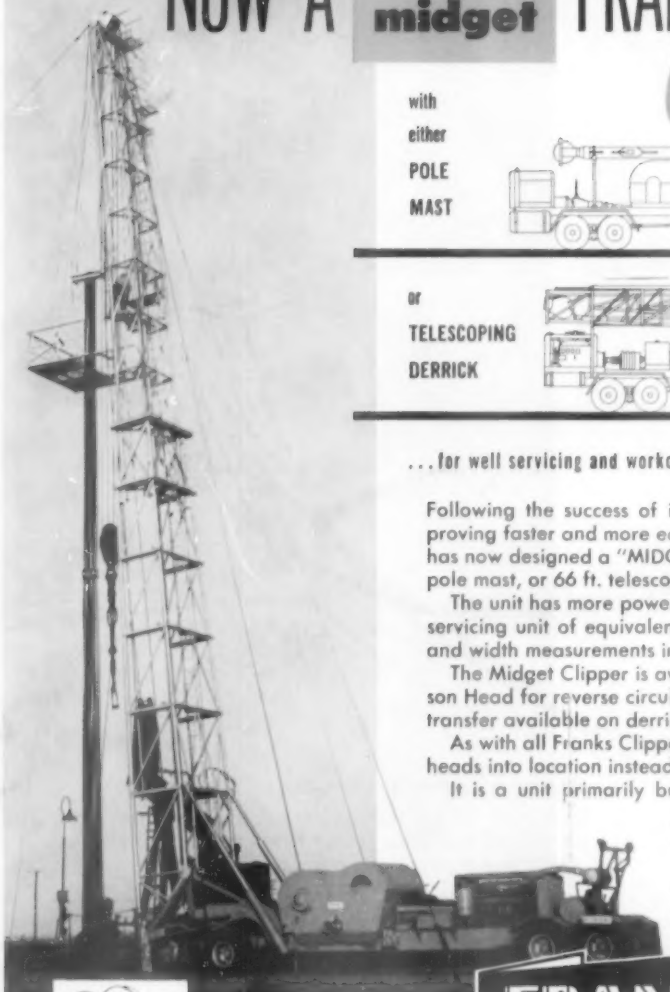
with either POLE MAST



or TELESCOPING DERRICK



The Picture Shows Franks GIANT CLIPPER for Deepest Production.



...for well servicing and workover work 4,000 to 9,000 ft.

Following the success of its heavy duty Clipper line of self-propelled units in proving faster and more economical in well servicing, rig-up, and moving, Franks has now designed a "MIDGET" CLIPPER (single or double drum) with either 65 ft. pole mast, or 66 ft. telescoping derrick.

The unit has more power than has been previously offered on a truck-mounted servicing unit of equivalent weight. It is legal in weight and in all road length and width measurements in all oil producing states.

The Midget Clipper is available with hydraulic drive for: rotary table; Guiberson Head for reverse circulation; tongs; raising and lowering derrick. Air lift rod transfer available on derrick type.

As with all Franks Clippers, the Midget affords perfect location "spotting" as it heads into location instead of backing in.

It is a unit primarily built for well servicing, although it is completely self-propelled using the industrial type power plant to move the unit from location to location.

Like all Franks equipment, the Clippers are of rugged build which assures long life and less maintenance.

State whether you are interested in pole mast or derrick type in writing for complete specifications on the new Franks Midget Clipper.

Improved, simplified *full air* clutch standard on all Clipper models.

All Franks units now have new hardened brake flanges.

FRANKS MFG CORP. WELL SERVICING AND DRILLING UNITS TULSA, OKLAHOMA

"on the SPOT" FIELD SERVICE

FRANKS MFG. CORP.

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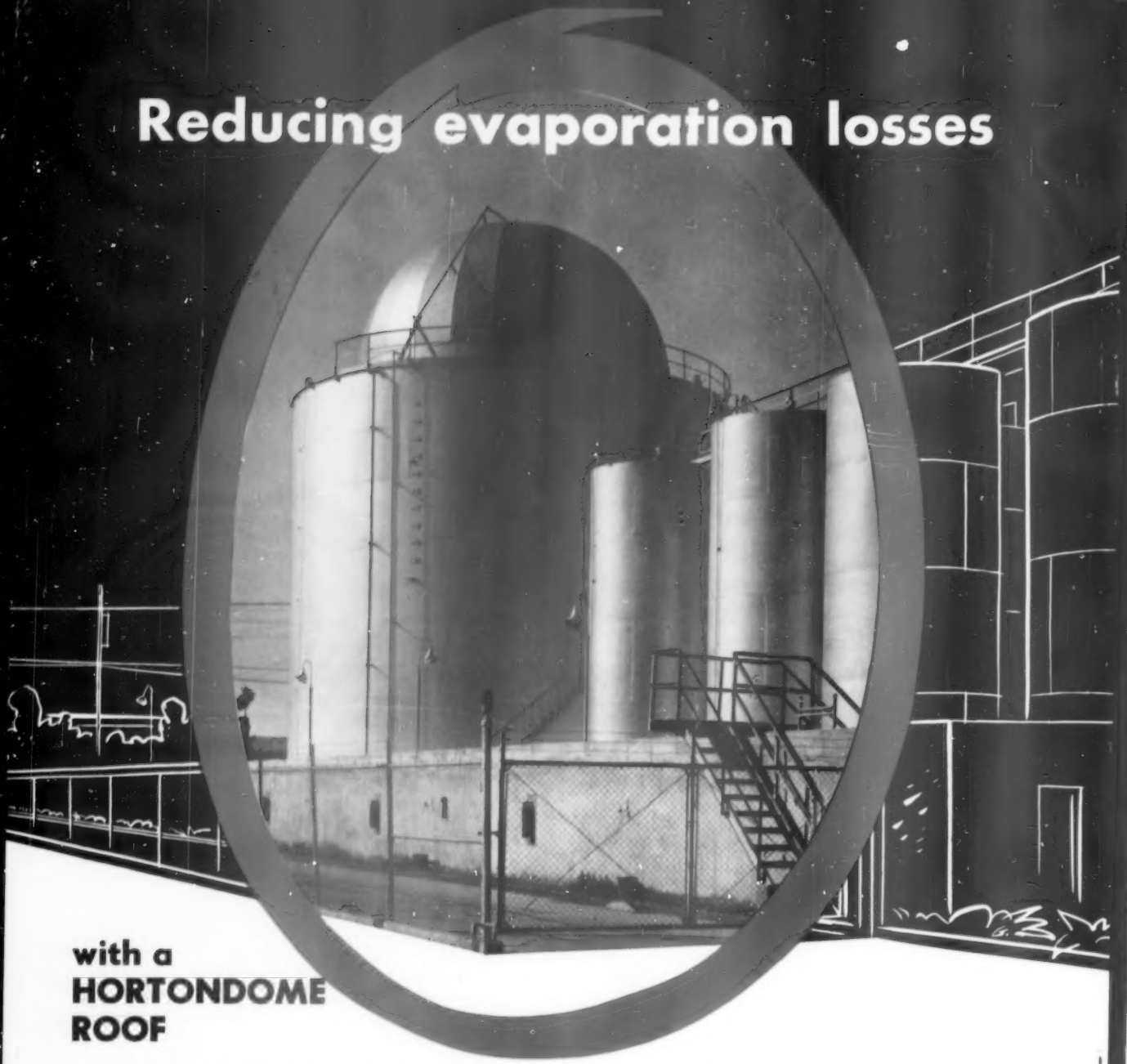
Reducing evaporation losses



with a HORTONDOME ROOF

The Hortondome* Roof is a special type of roof designed to prevent evaporation losses from flat-bottom oil storage-tanks. Of butt-welded construction, the Hortondome is located in the center of the roof. A flexible, hemispherical membrane on the inside of the dome is attached by its outer edge to the equator of the Hortondome. As vapor is formed in the tank or filling takes place to displace vapor, the membrane rises to make room for the air-vapor mixture. When conditions causing the vapor to expand are reversed, the flexible membrane goes back down. No vapor is vented to the atmosphere unless expansion exceeds the capacity of the installation.

A tank with a Hortondome Roof may be operated as an individual unit or it may be connected, by vapor lines, to the vapor spaces of adjacent fixed roof tanks. In this manner it acts as a central storage unit of a vapor conservation system.

Write our nearest office for information, estimates or quotations on Hortondome Roofs or any other Horton welded steel plate structure for the petroleum industry.

**Trade Mark*

CHICAGO BRIDGE & IRON COMPANY

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

Atlanta, 3	2154 Healey Bldg.	Detroit, 26	1514 Lafayette Bldg.	Pittsburgh, 19	3228 Alcoa Bldg.
Birmingham, 1	1536 North 50th St.	Houston, 2	2119 C & I Life Bldg.	Salt Lake City, 4	525 West 17th South St.
Boston, 10	1025-201 Devonshire St.	Los Angeles, 17	1523 General Petroleum Bldg.	San Francisco, 4	1554—200 Bush St.
Chicago, 4	2128 McCormick Bldg.	New York, 6	3347—165 Broadway Bldg.	Seattle, 1	1325 Henry Bldg.
Cleveland, 15	2204 Midland Bldg.	Philadelphia, 3	1615—1700 Walnut Street Bldg.	Tulsa, 3	1606 Hunt Bldg.

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the OIL AND GAS JOURNAL

OCTOBER 25, 1954 VOL. 53 NO. 25

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In Brief ...

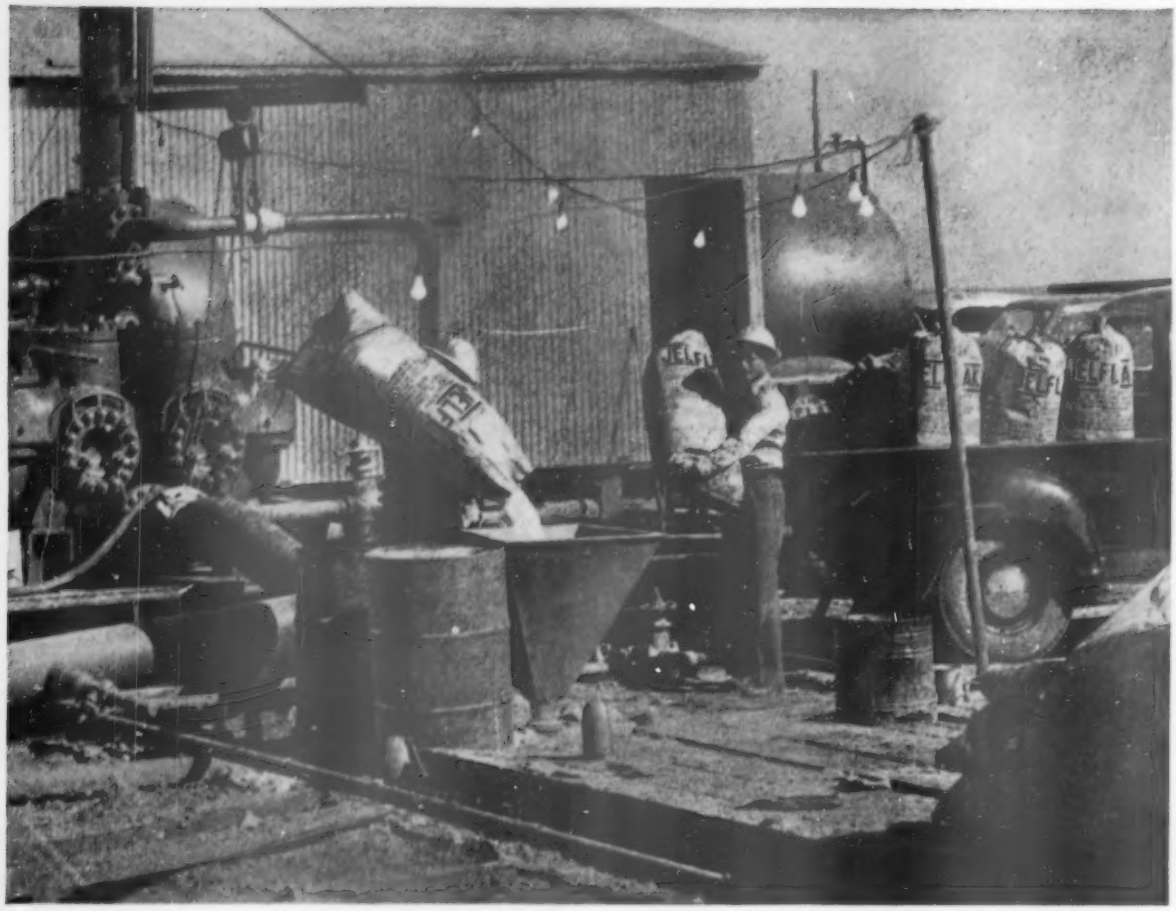
1. RECORD YEAR . . . Current statistics reveal that 1954 will probably be another record year for petrochemicals, even though total chemical production will fall below that of 1953. This means that natural gas and petroleum derivatives are expected to furnish a bigger percentage of chemicals this year.

Current production trends, compared with incomplete production figures for the year, indicate the total output of petrochemical intermediates should reach nearly 27 billion pounds, up roughly 1 billion pounds from 1953. Aliphatics will fall below last year's record figure, but gains in aromatics and inorganics will offset this.

2. PETROCHEMICAL PROGRESS . . . A four-part section on latest petrochemical developments. In first article are details of manufacture of ethylbenzene by the high-pressure process and by the $AlCl_3$ process. The second article deals with production of improved ethylene by monitoring with continuous infrared analysis. The other two articles cover latest developments in ammonia manufacture. Atlantic Refining's new ammonia plant is first to use hydrogen tail gas from catalytic reformer for making ammonia. Partial oxidation with air may prove feasible in preparation of ammonia synthesis gas, particularly if some byproduct hydrogen is available.

3. IMPROVED STATION . . . Los Banos station is one of country's largest unattended automatic pipeline installations. There are several design innovations, station is equipped with conventional, open-type motors; there is no throttling device for controlling station discharge pressure; and station is started with fully open discharge gate.

4. STEPPED-UP DRILLING . . . Three new fields in the Beaver Lodge-Tioga area have helped to step up drilling activities on the Nesson anticline, main producing trend in North Dakota. All three fields produce from the Madison limestone. With these discoveries, the Williston basin is entering a long-range drilling and development program.



JELFLAKE PREVENTED LOST CIRCULATION

$15,000 saved in mud cost and drilling time

Big dollar savings are being made by operators who use Jelflake®—Dowell's fragmented plastic foil—*to prevent* lost circulation before it starts. Jelflake is also used to regain circulation quickly and economically after it is lost.

For example, before drilling into what was known to be a critical thief zone, one operator began adding Jelflake to the mud to avoid loss of circulation. Drilling proceeded through the thief zone with Jelflake being added systematically. As a result of this reliance on Jelflake as a preventive measure, there was *no lost circulation*. The operator estimated Jelflake saved about $15,000 in mud cost and rigtime.

Jelflake is easy to use. Just add it to mud through a hopper or at the mud hog suction. The varied sized flakes are designed to work two ways—to plug pores and to plaster the faces of thief zones. Jelflake is unaffected by water, oil, mud chemicals, bacterial action or high bottom-hole temperatures; and it won't clog regular equipment.

Call your mud distributor or the nearest Dowell office for a supply of Jelflake in 25-pound, wet-proof bags. Or write to DOWELL INCORPORATED, Tulsa 1, Oklahoma, Dept. J-11.

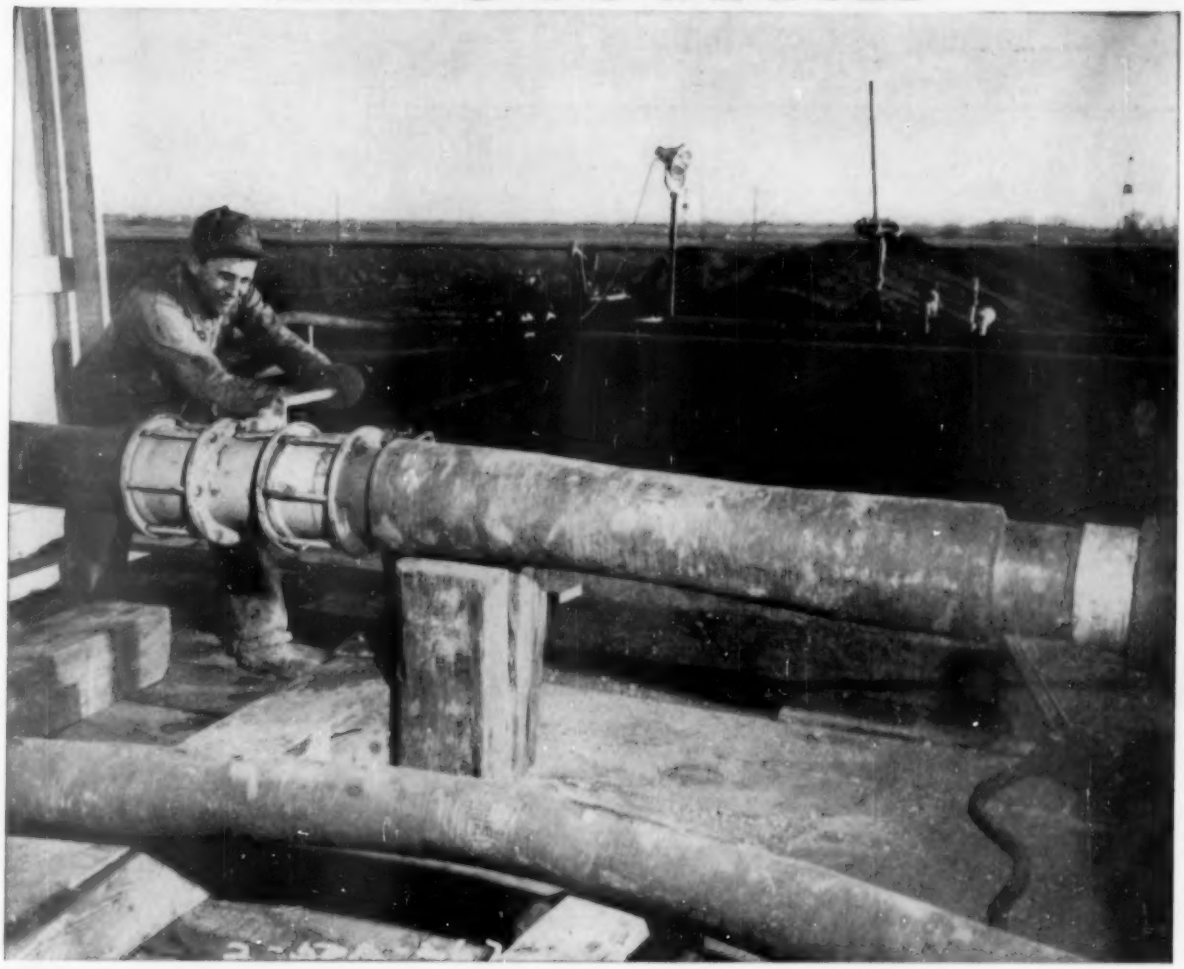
DOWELL SERVICE

chemical services for the oil industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Mud pump hose tough all over; tube would outwear steel

COVER, tube, reinforcements—all have been improved by B. F. Goodrich to build a mud pump suction hose to take more rough wear than any hose you've ever used.

Smooth, tough tube—B. F. Goodrich mud pump suction hose has an oil-proof tube especially developed by B. F. Goodrich to give high abrasion resistance. It's so tough it actually outwears steel in many applications. Tube is smooth so mud flows through at high speed.

Roughneck cover—It's practically abrasion-proof. Move it from job to job, drag it into position, load it into a truck—but be sure it's B. F. Goodrich hose with its extra-tough cover for extra-hard service.

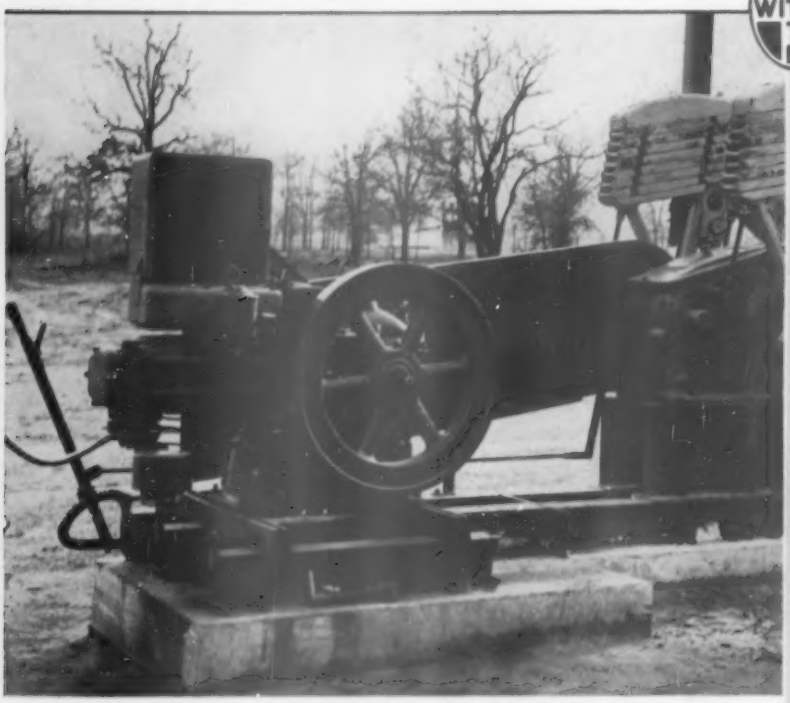
Takes your highest vacuum—B. F. Goodrich mud pump hose will take the highest vacuum pressures used in mud pump work. Heavy spring steel wire spiral-wrapped and imbedded in rubber prevents collapse, keeps rig drilling without costly repairs.

Cords cushioned in rubber—This hose is reinforced with four to six plies of cord—held together and cushioned by rubber that surrounds each individual cord. No cross threads. Hose is more flexible to help dampen vibration, yet stronger to resist crushing and kinking.

Should your local supplier be temporarily out of stock when you call, you can get B. F. Goodrich mud pump hose any time—day or night—from one of these B. F. Goodrich warehouses: Beaumont, Dallas, Fort Worth, Hobbs, Houston, Odessa, Wichita Falls, Great Bend, Oklahoma City, New Orleans, Tulsa, Williston, Denver and Los Angeles. *The B. F. Goodrich Company, Dept. M-525, Akron 18, Ohio.*

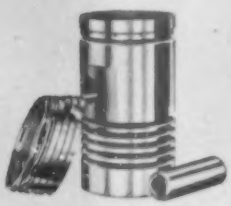
B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

FIRST CHOICE of pumpers everywhere
...because of these features

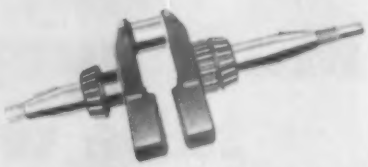


Replaceable, wet-type cylinder liner can be easily installed in the field.

Cylinder head has large gas passages and is fitted with replaceable, alloy seat inserts and valve guides.



Piston is precision ground and fitted with four compression rings and two oil rings.



Crankshaft is of heat-treated, forged steel, counter balanced, and mounted in shim-adjustable tapered roller bearings.

OTHER FEATURES

• Witte Engines are designed with condenser-type cooling and with a large capacity oil reservoir, so they can provide continuous 24-hour-a-day operation with a minimum of attention. Their weather-resistant construction permits operation under extreme conditions the year around.

Available in all oilfields...
through your favorite supply store

WITTE ENGINE WORKS

OIL WELL SUPPLY DIVISION · UNITED STATES STEEL CORPORATION
1601 Oakland Ave., Kansas City 26, Mo.

WITTE ENGINES

Gas-gasoline — Models from 3.8 to 15.5 hp.

Full diesel — Models from 3.75 to 12.5 hp.

USS

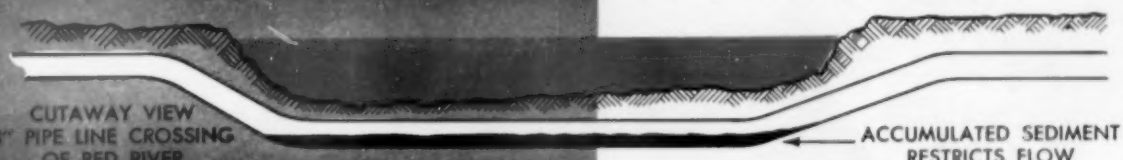
UNITED STATES STEEL

Know-how and Equipment

SOLVE A PIPELINE PROBLEM

1st OF A SERIES

1 Due to excessive pressure drop in this Red River crossing, management knew there must be considerable restriction in this section, probably accumulated silt, rust and scale, which must be removed to increase flow.



CUTAWAY VIEW 8" PIPE LINE CROSSING OF RED RIVER

ACCUMULATED SEDIMENT RESTRICTS FLOW

2 Williamson engineers were asked to help solve the problem, quickly and economically. They developed a special Pig which could safely traverse pipe half-filled with silt, rust and scale, removing a portion of the accumulation with each run, thus preparing the line for routine cleaning with "WC" Pigs.

3 This special Pig was built and tested in Williamson's completely equipped laboratory by engineers experienced in pipeline operations.

4 Williamson's representative, a factory-trained engineer, was on hand when the river crossing was cleaned. He assisted in preliminary pigging with the special Pigs and final clean-up with the "WC" Pigs. As a result of this operation, flow conditions returned to normal, and throughput was increased.

These same services are available to all pipelines at no extra cost.

WILSON FACTORY-TRAINED FIELD REPRESENTATIVES

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Another Job well done

WITH THE RIGHT TOOLS PROPERLY USED

T. D. Williamson, Inc.

P. O. BOX 4038 • TULSA 9, OKLAHOMA

September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. U. S. and foreign rates to the petroleum industry, $4 yearly.

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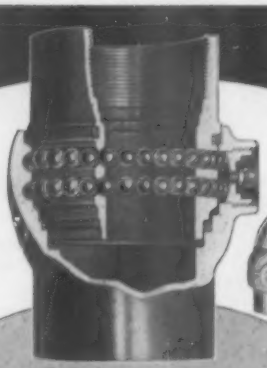
BRONZE

STEEL



OPW

swing joints

FULL UNRESTRICTED FLOW • EFFORTLESS MOVEMENT
GREATER LOAD CARRYING CAPACITY • "O" RING SEALED
CONTAMINATION FREE OPERATION • PERFECT ALIGNMENT

The wide range of sizes and styles of OPW BALL BEARING SWING JOINTS offers many and varied applications for safely handling liquids of diversified viscosity at required temperatures and working pressures.

Millions of gallons of all types of liquids are moved daily in flow lines where perfectly sealed, rotating OPW Swing Joints provide an almost limitless range of flexible operations.

Join other users of OPW Swing Joints. You can also realize economies in your liquid products handling.

Free Catalog F-8

provides engineering data, sizes, styles, recommendations and prices.

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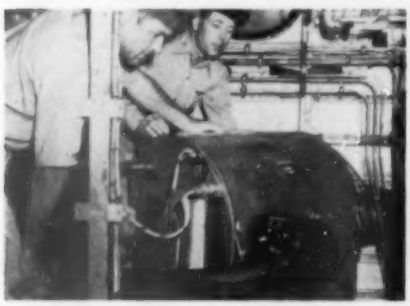
Solar "Mars" gas turbine proves reliability



Solar unit on Douglas Globemaster

THE FIRST SOLAR "MARS" electric generator set to be installed on a Douglas C-124C recently reached its 500-hour service mark without trouble or overhaul . . . *more than twice the initial estimates when the unit was put in use in 1953!*

Today small gas turbine engines are an auxiliary power source of proven, trouble-free reliability. They are adaptable to many uses where compactness, light weight, simplicity and ruggedness are needed.

The 50 hp Mars weighs less than 100 lb, is smaller than a two-foot cube, and operates on a variety of fuels. A great new *practical* prime mover has been born. Where will it fit in your business?

SOLAR
AIRCRAFT COMPANY
SAN DIEGO
DES MOINES

DESIGNERS, DEVELOPERS AND MANUFACTURERS OF METAL ALLOY PRODUCTS

This is What Solar Offers You

Solar specializes in the manufacture of precision products from alloys and special metals for severe service. Solar's experience since 1927 is unduplicated in this field. Solar skills and facilities range from research, design and development through to mass production. Wherever heat, corrosion or difficult specifications are problems, Solar can help you solve them.

PLANTS. *In San Diego and Des Moines (photograph above). A total of 1,400,000 sq ft of floor space. Approximately 5,000 employees. Annual sales over $65,000,000.*

EQUIPMENT. *Production equipment for all types of metal fabrication—forming, machining, welding, brazing, casting, coating. Extensive laboratory and testing equipment. Facilities for development, prototype, limited or mass production.*

SERVICES. *Research, design, development, tooling and production engineering staffs. Experienced with all alloy steels, stainless alloys, super alloys, and titanium and its alloys. Government source inspection and Solar quality control meet rigid aircraft and commercial standards.*

CONTRACT PRODUCTION

Current orders include aircraft engine and airframe parts, alloy castings, pneumatic ducting, atomic energy components. Customers include some of the most honored names among aircraft and industrial companies in the U.S. and Europe.

SPECIAL PRODUCTS

Bellows. *"Sola-Flex"® bellows and expansion joints in many designs from ⅛ in. up to the world's largest, 28 ft in diameter.*

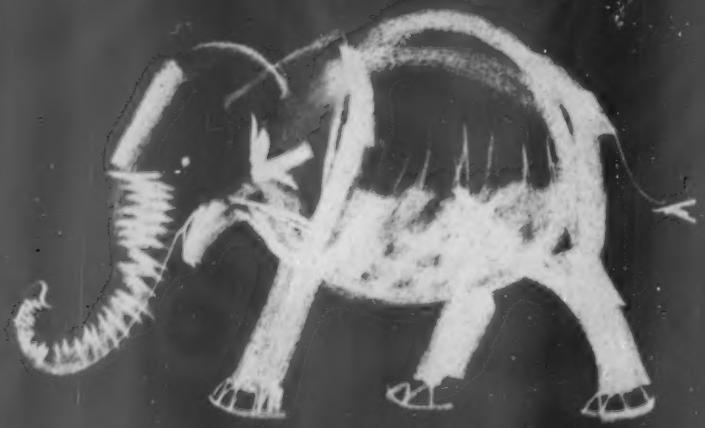
Gas Turbines. *Solar "Mars" 50 hp engines for auxiliary generator sets, ground carts, portable fire pumps; Solar "Jupiter" 500 hp engines in variable and constant speed models.*

Ceramic Coatings. *"Solaramic"® is the Solar trade mark for a family of coatings that protects metals from heat, corrosion, galling and abrasion.*

Controls. *Complete control systems utilizing the new Solar "Microjet"® principle for control of gas turbines, jet engines and pneumatic devices.*

FURTHER INFORMATION
Your inquiry regarding any Solar service or facility will receive prompt attention. Address Solar Aircraft Company, Department A-35, San Diego 12, California.

WHEN YOUR JOB CALLS FOR
CHAIN WITH THE LONG LIFE OF AN

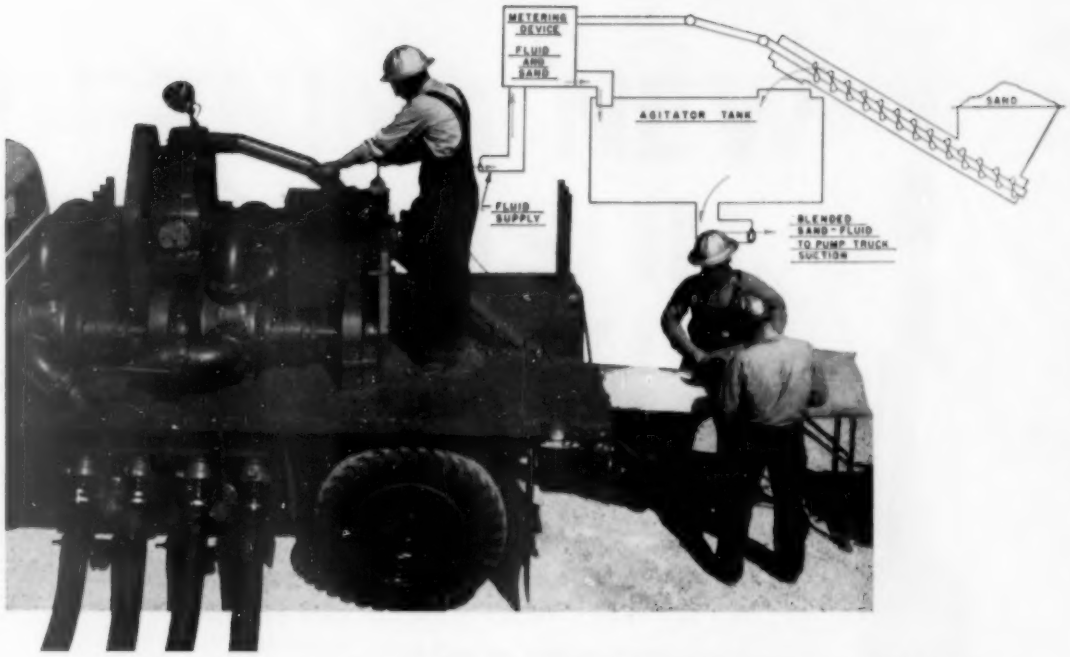


BE SURE IT'S
REX ROLLER CHAIN*

THE CHAIN THAT CONSISTENTLY DOES A DAY'S WORK YEAR AFTER YEAR AND DOESN'T EXPECT TOO MUCH ATTENTION. DRILLERS LIKE THE LONG SERVICE RECORD OF REX ROLLER CHAINS.

CHAIN BELT COMPANY
ROLLER CHAIN DIVISION
357 PLAINFIELD STREET
SPRINGFIELD 2, MASS.

*WE'VE CHANGED OUR NAME... but the chain's the same. Baldwin-Rex Roller Chain is now called Rex Roller Chain and the Baldwin-Duckworth Division is now known as the Roller Chain Division of Chain Belt Company.



BIG FRAC CONTROLS GIVE NEW SUCCESS to HALLIBURTON'S FORMATION FRACTURING SERVICES

Variable and continuous control of sand and oil *during the fracturing job* gives new success and safety to the big frac treatments that are today's most valuable production improvement technique. Halliburton's new Proportioner controls the high volume, high injection rate operations with precision that permits special treatments for each individual well.

Formations that can easily take high concentrations, or those that must have a gradual increase in concentration or even those that tend to plug can now be more carefully treated. The new Proportioner allows the Sandoil mixture to be varied as to ratio and volume during all phases of the treatment—minimizing the danger of ruining formations with an uncontrolled, constant rate batch mixture.

The new Proportioner consists of a metering pump to supply oil, a proportioning screw to transport sand and a mechanical agitator in a mixing tank of relatively small volume. This equipment, which insures proper and complete blending, allows fast changes of sand concentration and injection over wide selected ranges at any time during the treatment. By providing this safety margin and operating at high rates of injection and mixing large volumes, the Proportioner adds more controlled power to all fracturing work.

The new Proportioner and other Halliburton fracturing advances—special pumpers, manifolding systems, improved carrying agents, selected sands—all increase the safety, success and effectiveness of fracturing. You get the benefit of all these improvements plus the unmatched 40,000 job experience when you call for Halliburton . . . first and foremost in formation fracturing! Call your local or district Halliburton office. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

FRACTURING SERVICES

PERPETUAL PROGRESS IN PRODUCTION IMPROVEMENT TECHNIQUES

DEMONSTRATION... at the API Meeting!

The new Gilbarco Electronic Tank Gauge will be demonstrated *in actual operation* at THE API MEETING in Chicago, Nov. 7-11.

Place: Conrad Hilton Hotel

Suite: 826-A

Time: At your convenience

As a new, effective means of controlling inventories and stock losses, this new development of *electronic* measurement merits your close inspection. Drop in at Suite 826-A at any time.

OPENING NEW HORIZONS IN ACCURACY!

Now tank farms and refineries can maintain at least 100% greater accuracy with the new Gilbarco Electronic Tank Gauge. *No other tank gauge today* offers all these advantages for liquid measurement:

★ **Accurate** to 1/16 of an inch.

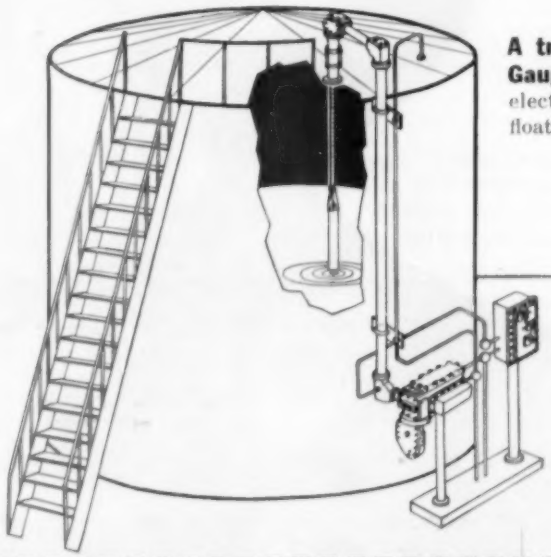
★ **Exterior Installation** and maintenance, without taking tank out of service.

★ **Not affected** by variations in specific gravity or viscosity.

★ **Can be used** in any type of low pressure tank.

★ **Can be supplied** with automatic switches and an instrument to indicate the average temperature of the product.

★ **Remote reading** equipment available for accurately transmitting temperature and liquid level data.



A truly Electronic Tank Gauge – actually *measures* electronically, not with a float!

For assured accuracy... get all the facts on the new Gilbarco Electronic Tank Gauge today!

GILBERT & BARKER MANUFACTURING CO.
West Springfield, Mass.

Please send us complete information on the Gilbarco Electronic Tank Gauge.

NAME_____

COMPANY_____

ADDRESS_____

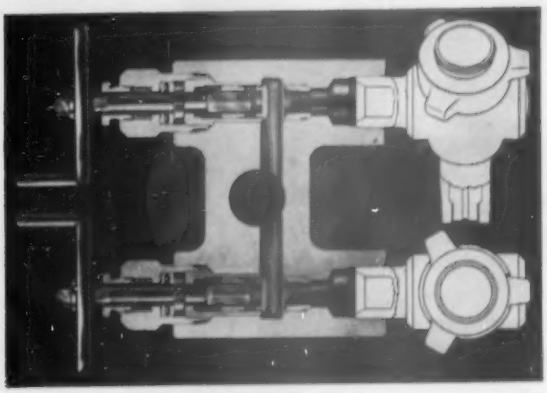
CITY_____ STATE_____

Gilbarco

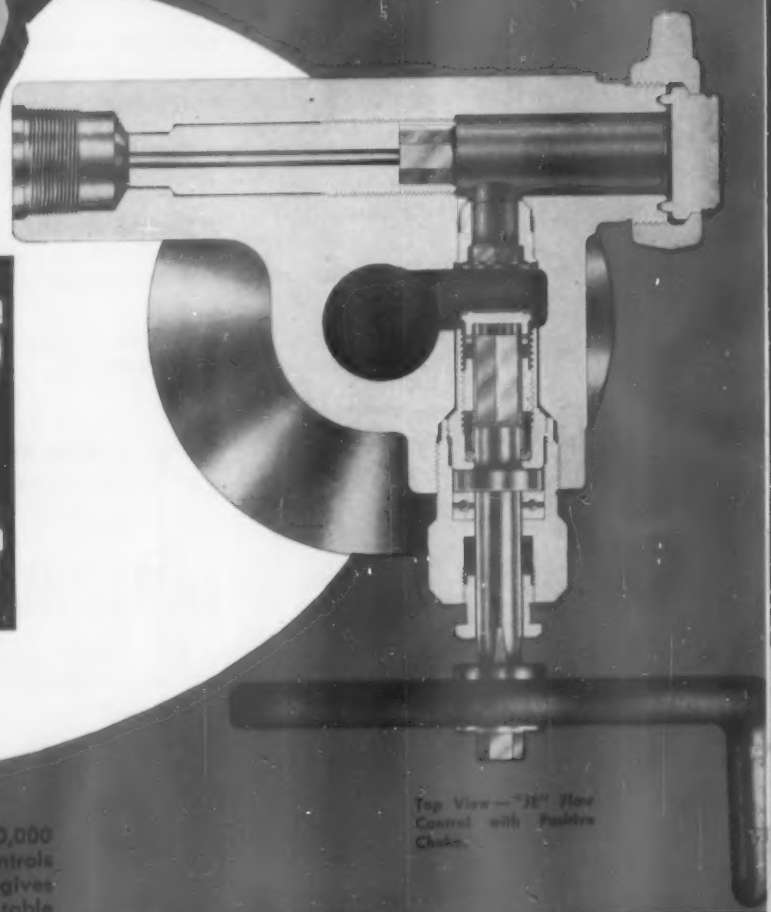
West Springfield, Mass.
Toronto, Canada

O·C·T "JE" FLOW CONTROLS

SPECIFY THE CONTROL THAT IS PROVED IN THOUSANDS OF INSTALLATIONS



The O-C-T Dual Flow Control is an outstanding companion to the "JE" Flow Control units which have gained universal acceptance in oilfields all over the world. This unit replaces 13 different fittings.



Top View—"JE" Flow Control with Positive Choke.

Here's the proof of the puddin'! More than 10,000 successful applications of O-C-T "JE" Flow Controls . . . the only flow control on the market that gives you the advantage of both a choke (either adjustable or positive) and a true valve type gate assembly and seating arrangement . . . have proved them one of the most outstanding and dependable products ever offered the oil industry!

Why don't you take advantage of the savings and service this unit offers you? Before you top your next tree, let your O-C-T Representative tell you all the advantages and tremendous savings this remarkable O-C-T "JE" Flow Control unit offers you. Available through more than 700 supply store locations.

Oil Center Tool Co.

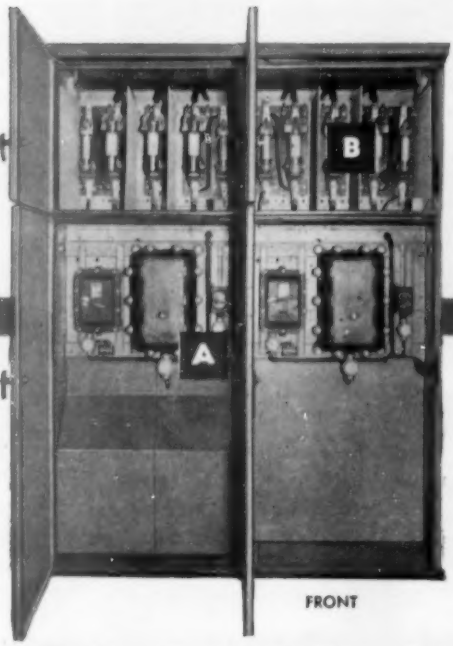
P. O. BOX 3091, HOUSTON, TEXAS

Export Representatives: Sterling Areau—La Grand, Suisse & Cie, Ltd., Rochester, Kent, England. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

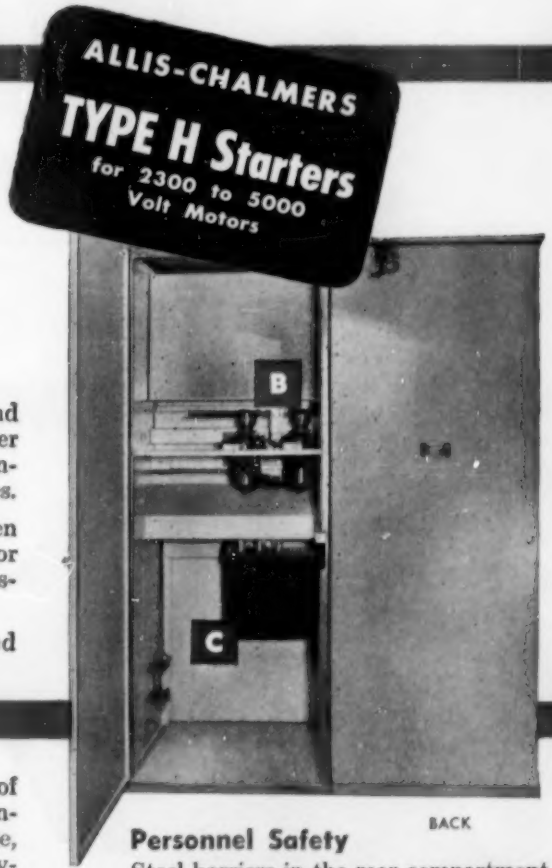
YOU CAN GET O-C-T "JE" FLOW CONTROLS ON ANY MAKE TREE

Engineered for SAFE Operation in Semi-Hazardous Locations

Built into every Allis-Chalmers Type H starter is the type and degree of protection dictated by applications. In these particular starters, installed in a semi-hazardous location, all arcing contacts are under oil or in explosion-proof cases.



FRONT



BACK

A All overload, undervoltage, timing and auxiliary control relays, as well as other low voltage switching devices, are enclosed in NEMA VII explosion-proof cases.

B Fuse disconnects cannot be pulled when carrying current. Fuse compartment door is *key-interlocked* to the control transformer primary oil cutouts.

C Main contactor is of the oil-immersed type.

Type H starters are built in a wide range of ratings for squirrel-cage, wound-rotor and synchronous motors — for full or reduced voltage, reversing or non-reversing — with plugging, dynamic-braking and multi-speed features. A new bulletin, 14B6410B, tells the complete story. See your nearby Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Personnel Safety

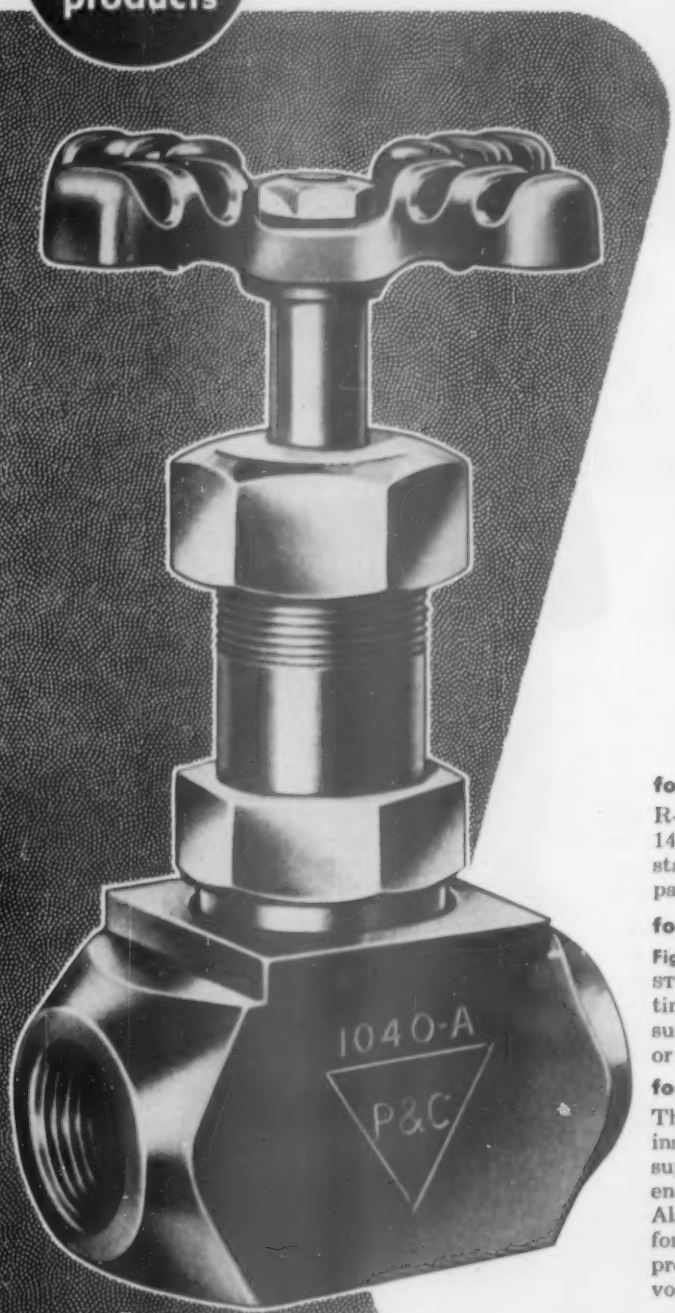
Steel barriers in the rear compartment prevent accidental contact with exposed live high voltage parts when operating the oil cutouts or removing the interlock key.

A-4446

ALLIS-CHALMERS

ACCO products

New 10,000 psi Rating for R-P&C Bar Stock Valve



New structural improvements in R-P&C's popular **Fig. 1040-A** carbon steel bar stock valve have resulted in substantially higher ratings for these rugged close control valves. New ratings range from 10,000 psi at 150°F to 475 psi at 1000°F. Sizes from ⅛" to 1". Each valve passes a hydrostatic test at 15,000 psi before leaving the factory.

R-P&C bar stock valves can supply an inexpensive, dependable answer to many of your valve application problems—particularly if these involve throttling or other close control service, high temperatures or high pressures. They are uniquely adapted for meter, gauge or instrument service or in crowded applications such as panel boards.

Fifteen different Fig. numbers in R-P&C's complete bar stock line provide close flow control for a wide variety of fluids. Pressure and temperature ratings, which vary for different materials and constructions, cover an extensive range. Among special applications covered are—

for Corrosion Resistance:

R-P&C Bar Stock valves are manufactured in 12-14% chromium stainless steel, and 18-8 molybdenum stainless steel for use with corrosive fluids—also particularly applicable for sub-zero service.

for Severe Throttling Service:

Fig. 1060-S Bar Stock valves have special discs of STELLITE—providing resistance to abrasion by cutting particles in extremely severe throttling service such as continuous blow-down with steam, water or other fluids.

for Close Quarters, Unusual Piping Hook-ups:

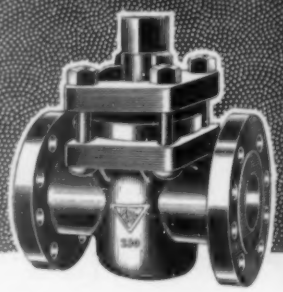
The adaptability of R-P&C Bar Stock valves solves installation problems. These versatile valves are supplied in globe and angle styles with female ends, male and female ends, or male union ends. Also provided with welding or silver-soldering ends for welded piping systems. Special lock bonnets provide additional protection in applications involving constant vibration.

Write TODAY FOR CATALOG

Pressure sealed bonnet joint cast steel valves are furnished in gate valve and globe valve styles in 900 lb., 1500 lb., and 2500 lb. pressure classes.

Lubrotite Gate Valves, exclusive with R-P&C, provide a patented lubricant seal which gives positive shut-off, retards corrosion, reduces maintenance. Furnished in iron, iron with bronze trim, cast steel with stainless trim, in sizes from 2" to 24".

Cast steel fittings, ells, tees, laterals, crosses, reducers—screwed or flanged ends. Furnished in a wide variety of sizes up to 24", in pressure classes from 150 to 2500 lbs.



Asbestos-packed cocks, an R-P&C exclusive, are furnished in iron in sizes from ¼" to 6" with screwed or flanged ends.

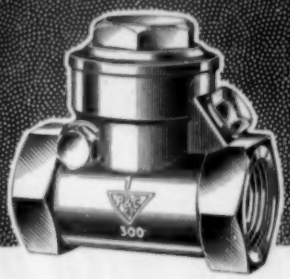


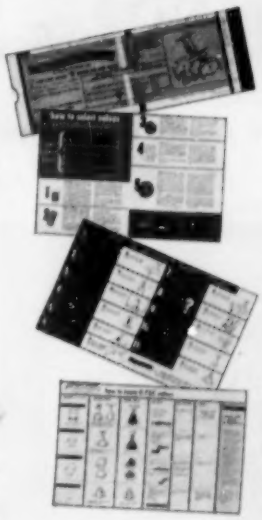
Fig. 212 screwed end bronze check valve typifies R-P&C's complete check valve line—furnished in iron, bronze or cast steel in sizes ranging from ¼" to 24".

Forged steel gate valves, like Fig. 6056 above, are offered in sizes from ¼" to 2" with flanged, screwed or welding ends. Pressure ratings range from 2000 psi at 100°F to 380 psi at 1000°F.

Which of these FREE TECHNICAL AIDS do you want?

R-P&C manufactures a *complete* line of valves—the units above only begin to indicate the comprehensiveness of the R-P&C line. In addition R-P&C supplies complete technical assistance—provides every possible aid to assist the buyer in valve selection, installation and operation. A few of these technical aids are shown at right.

Any of the above technical aids furnished promptly on request. Write R-P&C Valve Division, American Chain & Cable, Reading, Pennsylvania.



VALVE SELECTOR SLIDE RULE
Handy selector slide rule gives all dimensions for iron body valves, steel valves in 150, 300, 400, 600, 900 and 1500 lb. classes.

HOW TO SELECT VALVES
17" by 11" wall chart lists principles to use in selecting valves for various applications . . . considers effects of fluids, temperatures, pressures, sizes and service requirements. Glossary of valve terms included.

HOW TO PROTECT YOUR VALVES
17" by 11" wall chart lists 22 installation and operation pointers to protect valves, get maximum life. Includes glossary of valve terms.

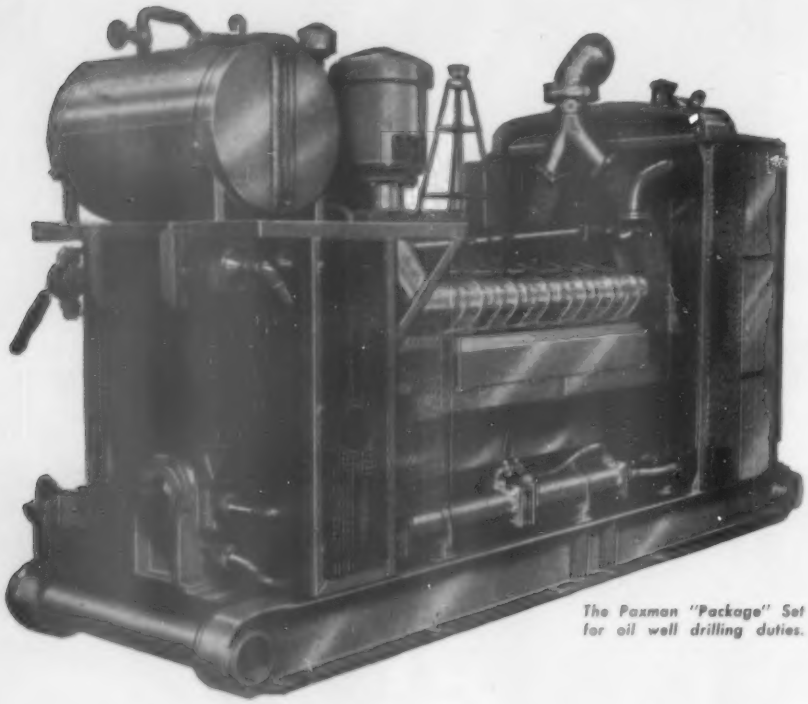
HOW TO KNOW VALVES
17" by 11" wall chart graphically shows appearance, construction, operation, recommended applications for gate, globe and check valves, cocks. Also National Safety Council operating recommendations.

ACCO
TRADE MARK

R-P&C Valve Division
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

R-P&C valves



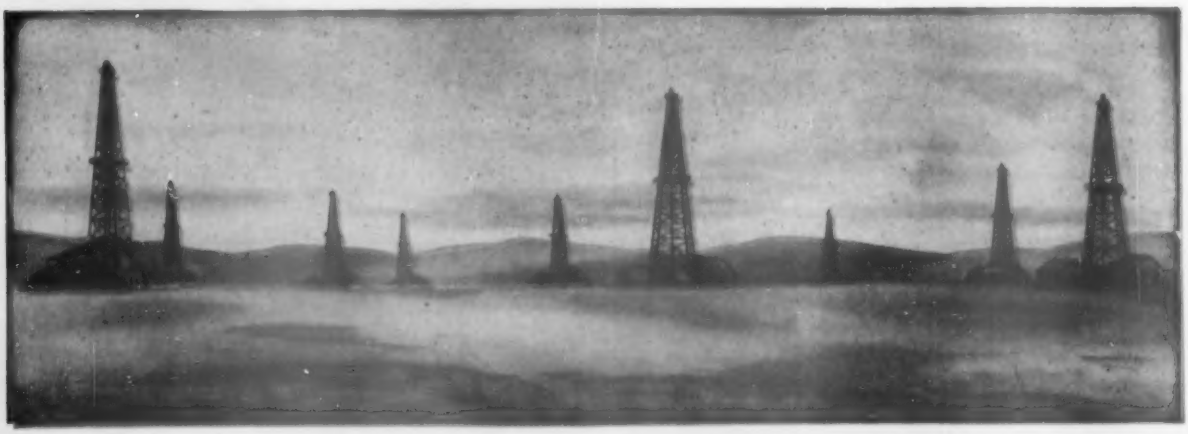
The Paxman "Package" Set for oil well drilling duties.

packed with power

Those engaged in the tough, arduous work of oil well drilling think highly of the Paxman "Package" Set. They like it for its sufferance of rough handling, its ability to keep going under any conditions and its adaptability for almost any type of drilling rig. Paxman Package Sets are available with a horsepower range of 130-665 s.h.p. at the output shaft.

PAXMAN *diesel engines for oil well drilling*

DAVEY, PAXMAN & COMPANY LIMITED COLCHESTER *(ASSOCIATED WITH RUSTON & HORNSBY LTD. LINCOLN)*



Save the beans - throw away the holes

LOW COST

UNIBOLT

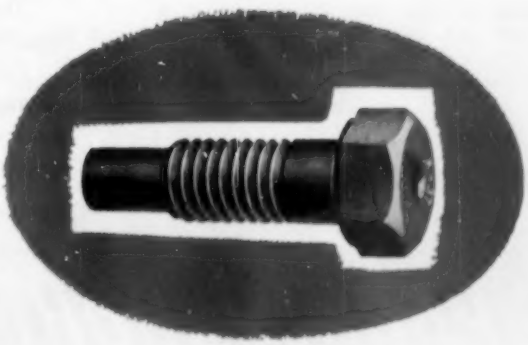
X-BEAN INSERTS MAKE POSITIVE CHOKES AS GOOD AS NEW

You don't have to change beans. Change inserts. You accomplish the same results but for a fraction of the cost. Unibolt Master Beans, for Unibolt Choke Bodies and Unibolt Cage Nipples, are drilled to receive a small replaceable insert. So, when the insert wears out just replace it . . . save the bean.

These little inserts are available in **42 "X" sizes under 14/64ths.** That means that they are drilled in increments of 5% and 10% of well flow rather than in increments of 1/64th inch. Consequently, the flow of fluid or gas can be positively controlled with a degree of accuracy never before attained. If, for example, a well produces 10 bbls. through a 1/64-inch choke, to increase the choke to the next largest fractionally drilled size, 2/64-inch, would increase the production to approximately 40 bbls. On the other hand, a well that produces 10 bbls. through a size X-35 UNIBOLT X-Bean would produce only 10½ bbls. through the next largest size X-Bean, X-35.5; 11 bbls. through an X-36, and so on.

This accurate control of production is a safeguard against the harmful effect of periodically pulling a well too hard in order to make its allowable.

• Illustrated — Unibolt Flow Manifold for single wing tree, consisting of Unibolt Tee, Wing Valve, and Positive Choke Body.



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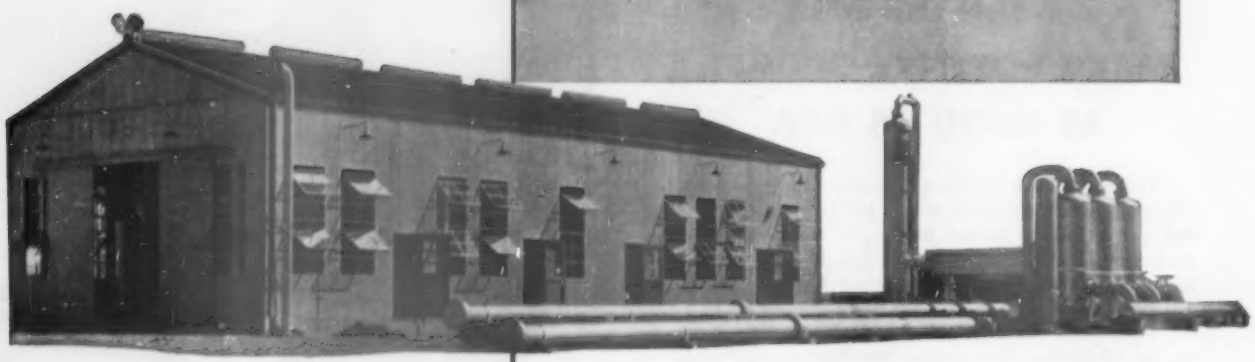

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They are available in structural, non-structural and multiple types for every oil industry need.

Before deciding on any building, write for our Steel Building catalog SB-6-53, or call your Parkersburg Representative who will work with you in selecting the type and size building best suited to your needs.

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OIL FIELD EQUIPMENT

The Parkersburg Rig & Reel Co. Parkersburg, West Virginia
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USE *Copon*... our revolutionary EPON® RESIN COATING

for POSITIVE PROTECTION of TANK AND PIPE INTERIORS

Here are the reasons why "Copon" is attracting the attention of leading corrosion and petroleum engineers:

- **It has exceptional tenacity, will adhere to metal surfaces longer and under more difficult conditions than any other coating yet tested.**
- **It is abrasion-resistant and has proven low erosion rate.**
- **It gives positive protection against rust and corrosion, also the chemical effects of crude oil, natural gas and salt water.**
- **It has amazing flexibility and elasticity.**
- **It provides a silky smooth, even surface that increases line flow by reducing friction.**
- **It is easy to apply by spray, brush or pig method.**

CPL

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TIE YOUR DERRICK TO A SPRINGKORE LINE!

SpringKore is the rotary drilling line of tomorrow! The new principle of a spring center creates and deserves confidence. It resists crushing and contends more successfully with loads, speeds, and well conditions that punish other lines.

When a section of this new line is finally worn out in service, that lubricant-packed spring center is just as round and lively as ever.

It's a lucky crew that drills with a SpringKore Rotary Line.

P·E·S·A
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"...here's MY warehouse!"

Jones & Laughlin
STEEL CORPORATION
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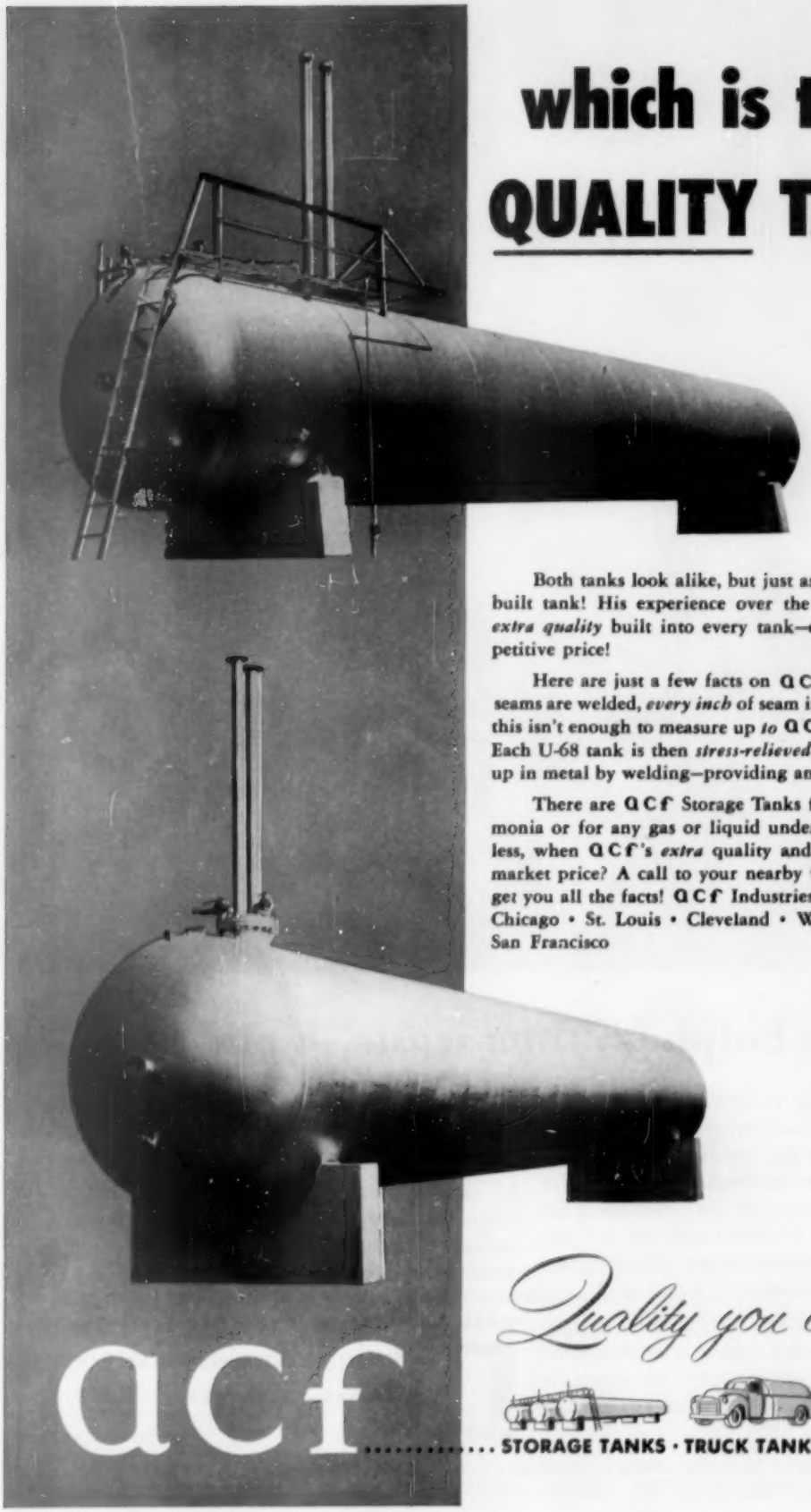
Serving The United States and Canada



which is the QUALITY TANK?

Both tanks look alike, but just ask the owner of an **ACF**-built tank! His experience over the years best illustrates the *extra quality* built into every tank—quality you get at a competitive price!

Here are just a few facts on **ACF** quality: After the tank seams are welded, *every inch* of seam is X-ray inspected. But even this isn't enough to measure up *to* **ACF**'s *traditional* standards! Each U-68 tank is then *stress-relieved* to remove the stresses set up in metal by welding—providing an *added safety factor!*

There are **ACF** Storage Tanks for LP-gas, anhydrous ammonia or for any gas or liquid under pressure. Why settle for less, when **ACF**'s *extra* quality and safety can be yours at a market price? A call to your nearby **ACF** Representative will get you all the facts! **ACF** Industries, Incorporated, New York Chicago • St. Louis • Cleveland • Washington • Philadelphia San Francisco

Quality you can trust

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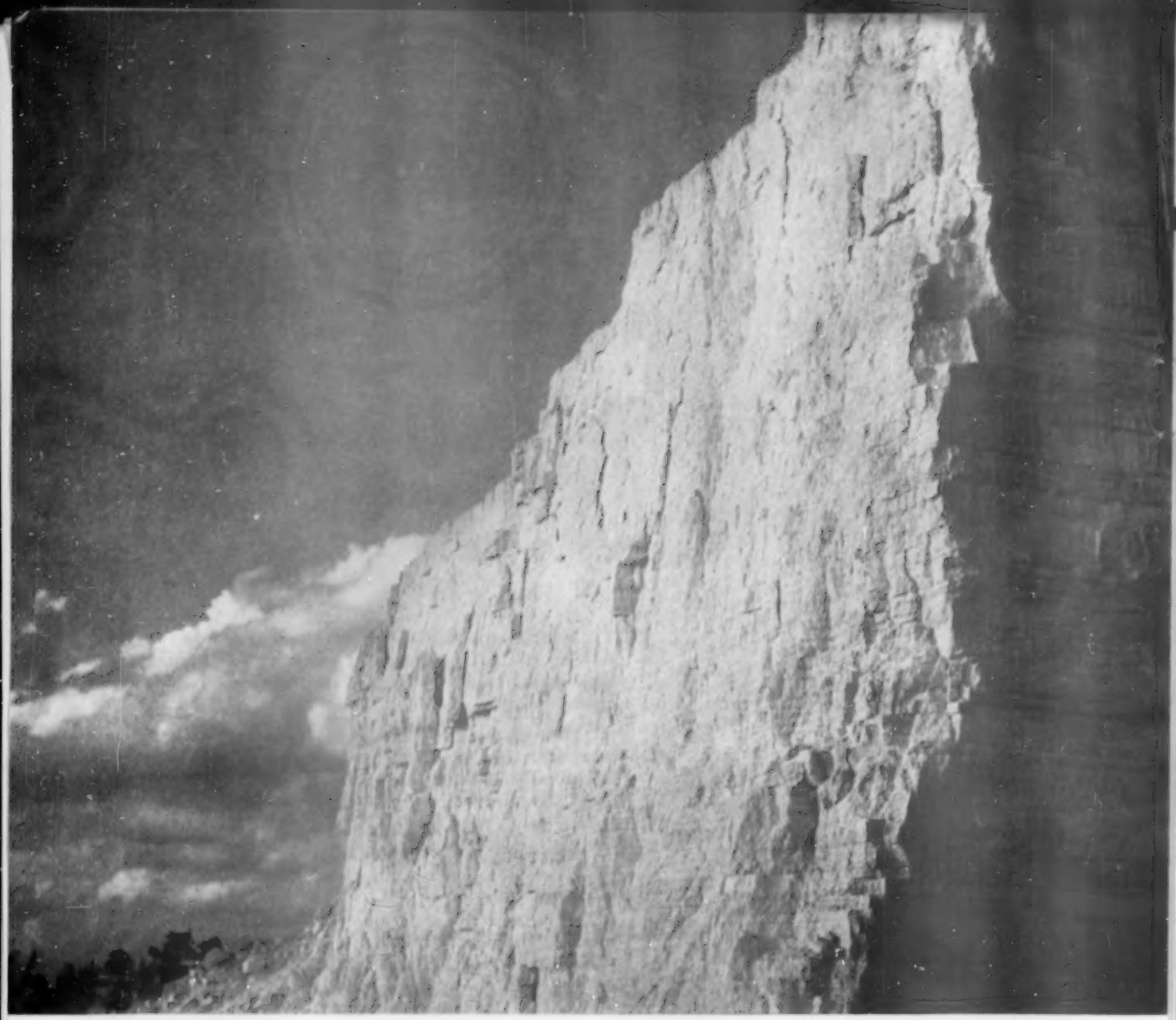
STORAGE TANKS · TRUCK TANKS · SAFETY VALVES



Mathieson Sulphur: *from waste, a pile of gold*

This bright yellow mountain, nearly five stories high, was cast of sulphur reclaimed from purifying natural gas and petroleum refinery wastes by Mathieson-developed recovery processes. The raw sulphur, of extremely high quality, is stored in these huge piles prior to grinding and refining. When needed, it is blasted from the face and processed into the many grades of sulphur that Mathieson makes for industry and agriculture.

Integrated operations and modern manufacturing methods help assure consistent product quality of *all* Mathieson chemicals. In addition, Mathieson offers consumers the protection of multi-plant production facilities . . . 3 major alkali plants, 7 sulphuric acid plants, 5 chlorine plants and 3 ammonia plants . . . as well as practical technical assistance with chemical handling and application problems.

In planning your chemical requirements call in your Mathieson representative. Perhaps you can buy to better advantage from one of America's largest producers of basic industrial chemicals.

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Personal service—western style

HERE is what Kaiser Steel means to line pipe users in terms of personal service.

It means that you can get immediate, on-the-spot service from our full staff of trained metallurgists, technical men, production men, and sales personnel.

This personal attention to your needs—plus *uniform quality, on-time delivery* and *wide range of sizes*—is another reason why Kaiser Steel can best meet the needs of the area it serves.

Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser

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Oil for Edison's Magic Lamp—

and for the Power Plants that Light America's Cities Today!

SEVENTY-FIVE years ago, when the incandescent lamp was born, Thomas Edison relied on a Socony-Vacuum oil to protect the generating equipment that provided the electricity. Today, to commemorate the diamond jubilee of light, Edison's original equipment has been re-activated at the Henry Ford Museum and Greenfield Village near Detroit. And once again a Socony-Vacuum Oil has been chosen to protect it.

There is good reason for this choice. Socony-Vacuum lubricants for power plants have been the standard of quality for over 75 years. In fact, more turbines of 5,000 kw and over are lubricated by Socony-Vacuum than by any other oil company.

We are proud that, during these past 75 years, we were able to play a part in bringing the magic of Edison's lamp—and of electricity—to people throughout the world.

SOCONY-VACUUM

SOCONY-VACUUM OIL COMPANY, INC.

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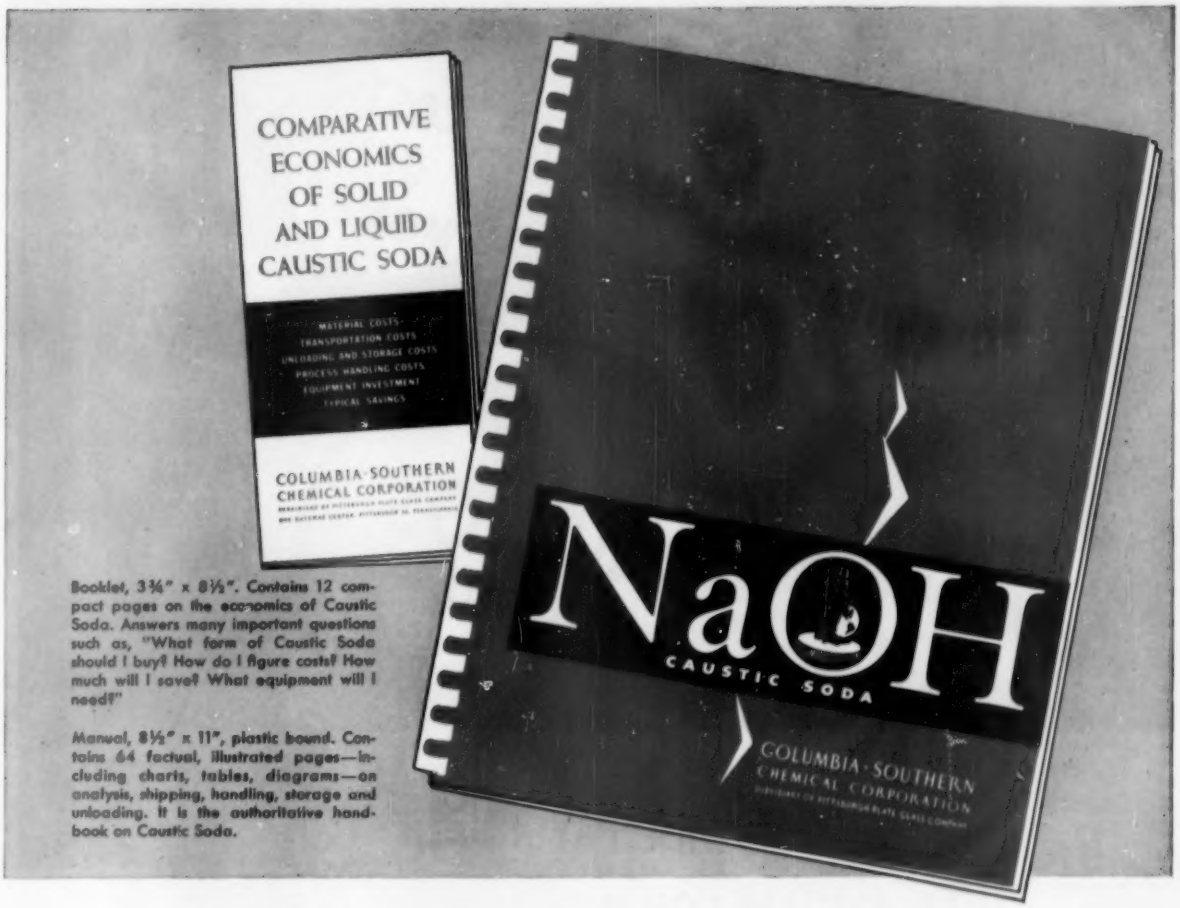

Booklet, 3¾" x 8½". Contains 12 compact pages on the economics of Caustic Soda. Answers many important questions such as, "What form of Caustic Soda should I buy? How do I figure costs? How much will I save? What equipment will I need?"

Manual, 8½" x 11", plastic bound. Contains 64 factual, illustrated pages—including charts, tables, diagrams—on analysis, shipping, handling, storage and unloading. It is the authoritative handbook on Caustic Soda.

Do you have these two valuable books on caustic soda?

If your work involves the handling, use, purchasing, or economics of Caustic Soda, and you do not have these books, you are urged to write for your free copies today. Ask for "Caustic Soda Manual" or "Caustic Soda Economics Booklet." If you want both, please specify. Use company stationery and send your request to Columbia-Southern Chemical Corporation, One Gateway Center, Pittsburgh 22, Pennsylvania.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
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WHY IT WILL PAY YOU TO USE BELL SYSTEM COMMUNICATIONS SERVICES

You save money

With Bell System services, you get efficient and dependable communications at low cost. You are relieved of maintenance, depreciation and other costs of privately owned communications.

You get the service you need

It's flexible and complete. We furnish communications tailored to your exact needs. No more, no less. A change in number or type of circuits can be made any time to keep your communications in step with changing needs.

You get the best service

The Bell System is constantly developing new equipment, methods and techniques to improve your service and keep your communications from becoming obsolete.

You have more investment money available

Your capital is *not* tied up in communications equipment but is available for investment in income-producing pipe line equipment and services.

You concentrate on your own business

Our business is entirely communications, and that's one reason the Bell System offers pipe line companies the finest services today. A communications study by specialists, made without charge, frequently indicates how a pipe line company can improve its communications and realize increased benefits and economies. Talk this over with the Bell Telephone representative near you.

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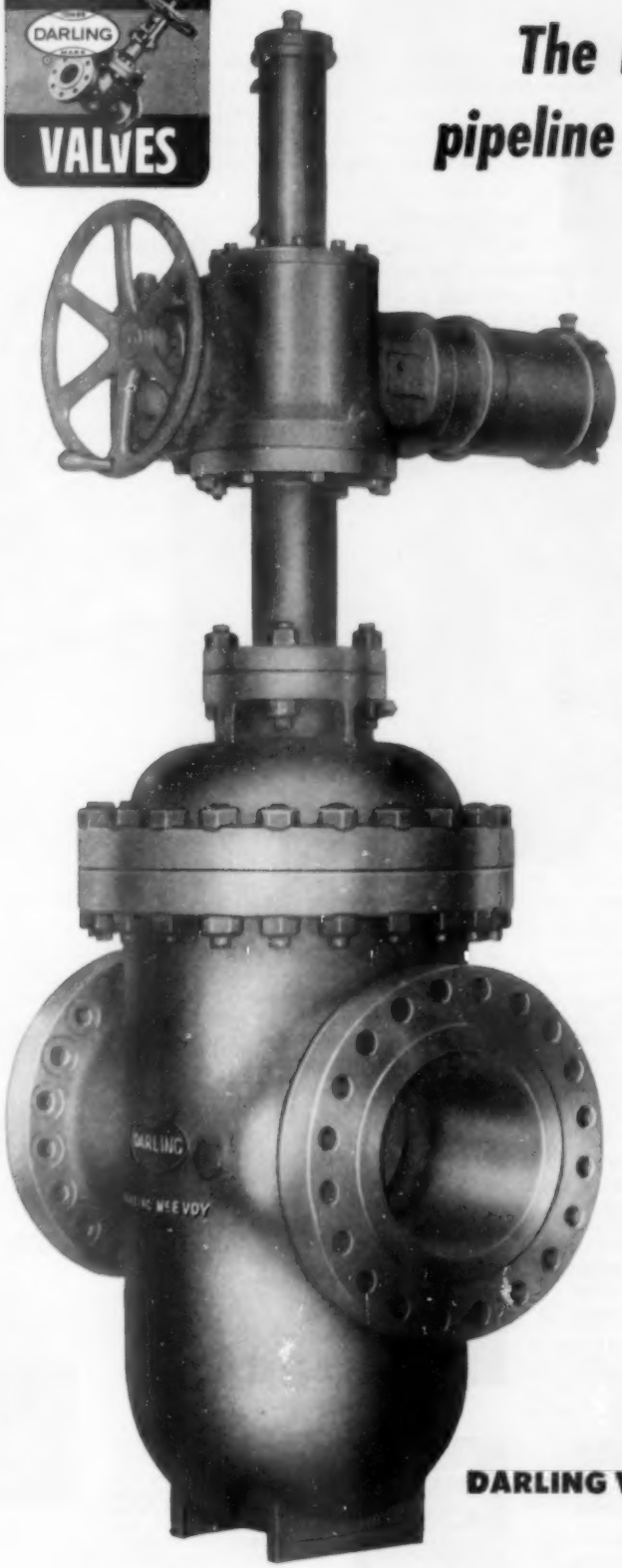
DARLING VALVES

The most important pipeline valve development in years

TRADE DARLING MARK McEvoy



New self-sealing two-way conduit valve for pipeline service automatically injects sealant by means of existing line pressure

Here's a new type of conduit gate valve, available in 8-inch and larger sizes, that gives positive downstream closure without dependence on metal-to-metal contact. Each time the valve closes, the required amount of sealant is applied automatically.

How it works

Employing the time-tested McEvoy principle, two cylinders, filled with special sealant, are located within the valve. Both are operated by line pressure. Depending on the direction of flow, line pressure actuates one or the other of these cylinders to force sealant into a channel in the downstream face of the seat. Since these cylinders hold enough sealant for 50 or more closures, the valves need only periodic servicing for recharging with sealant.

Write for details

Ask for bulletin #5402 which contains complete information on the design and operation of this valve.

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

CEC increases the scope of

industrial mass spectrometry

through two great instruments for process monitoring and control

Consolidated's Model 21-610 mass-spectrometer and its companion, the new Model 21-620, far excel all other instruments of comparable price in performance capabilities and reliability in industrial environment. The extreme sensitivity of the 21-610—accurate to a few parts per million—qualify it for highly critical purity studies as well as process monitoring and control applications. Fitted with an accessory hand-held probe, either model serves as a leak detector for any gas within its mass-range. The 21-620's resolving power up to mass 150 further extends the applicability of an industrial mass-spectrometer to research laboratories and medical centers, as well as to plants of chemical, petro-chemical, petroleum and gas industries. Nearly identical in appearance, the 21-610 features the Diatron ion analyzer and the 21-620, a new cycloidal focusing analyzer.

21-620 Except for slightly less sensitivity, the 21-620 has all the capabilities of the 21-610 plus many others. Where the task is to analyze "heavy" gases or liquids, either in plant locations or in the laboratory, the 21-620 process monitor mass-spectrometer is the ideal control instrument.

21-610 The 21-610 is completely self-contained, needing only 110 volts and a small quantity of cooling water for operation. Moderately priced, easily movable, and economical to operate, the 21-610 is industry's ideal instrument for chemical research, process control and leak detection.

CEC Service Engineers quick change of ion analyzers (right) adds flexibility to Consolidated's two process monitoring mass-spectrometers. A cycloidal focusing analyzer assembly of the 21-620 type is being mounted in the vacuum rack in place of the Diatron analyzer of the 21-610.

The basic instrument can be augmented by many available accessories, thus broadening its application scope. At the far right, are a gas or light-liquid sample inlet system and chart recorder.

Consolidated Engineering
CORPORATION
300 North Sierra Madre Villa, Pasadena 15, California

Sales and Service through **CEC INSTRUMENTS, INC.**, *a subsidiary with offices in: Pasadena, Atlanta, Chicago, Dallas, Detroit, New York, Philadelphia, Washington, D. C.*

ANALYTICAL INSTRUMENTS FOR SCIENCE AND INDUSTRY

Investigate the application of industrial mass-spectrometry to your business. For full details about CEC's two companion process monitoring mass-spectrometers, send for Bulletin CEC 1824A-X

Are you troubled with these effects of off-brand and inefficient equipment:

1. Oil flared out of gas onto farmer's field.
2. Cheap valves and controls, that blow gas into storage tanks, thus creating a fire hazard and an unsightly, oil splotched, tank battery.
3. Looks the same as others, but lacks vital engineering experience behind the design of its hidden inner parts.
4. Orphan separators you are forced to service yourself, often with makeshift parts.

There's a Maloney-Crawford separator designed to handle every known separation problem efficiently. All designs are checked for efficiency by field observation of the oil and gas action in a transparent plastic separator.

Maloney-Crawford separators are equipped with the finest accessories and repair parts, and service is immediately available.

Also, producers have found that they can buy M-C's recommended size with assurance, instead of buying, as is often done, the next largest size to be sure it will handle the production.

Cal a M-C representative whenever you have a separation problem.

SALES AND SERVICE POINTS

United States: Artesia, Brush, Corpus Christi, Cushing, Dallas, Denver, Duncan, Fort Worth, Hobbs, Healdton, Houston, Lafayette, Midland, New Orleans, New York, Odessa, Oklahoma City, Pampa, San Angelo, Seminole, Tulsa, Wichita Falls.

Canada: Calgary, Edmonton, Regina, Swift Current, Virden.

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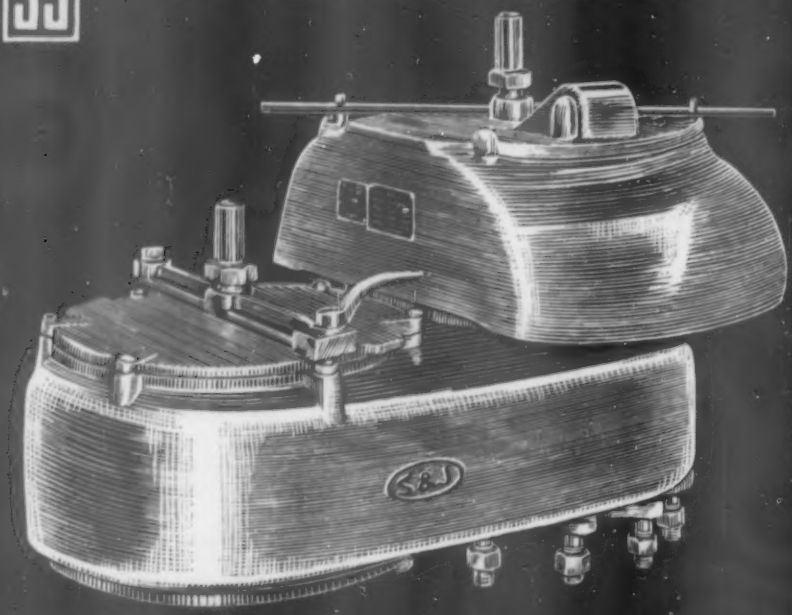
MALONEY-CRAWFORD TANK & MFG. CO.

Protect YOUR VALUABLE TANKAGE

with S&J weatherproof Breather Valves



THE SHAND & JURS poppet type breather valve is designed to deliver the maximum in performance under all weather conditions. It provides exceedingly high flow capacities within the range of normal pressure settings and over-pressure allowances, yet minimizes vapor leakage under the most rugged operating conditions.

Designated by S&J as Fig. ST-6949, this breather valve incorporates the following design features that assure top notch performance:

- Valve pallets automatically drain condensation away from their seats.
- Molded thermosetting phenolic pallets and seats with stainless steel pallet guides, offer maximum resistance to corrosion.
- Completely screened valve openings keep windblown particles, insects, rain, sleet and snow from hindering efficient pallet operation.
- Quickly removable pressure and vacuum hoods for fast, easy inspection.

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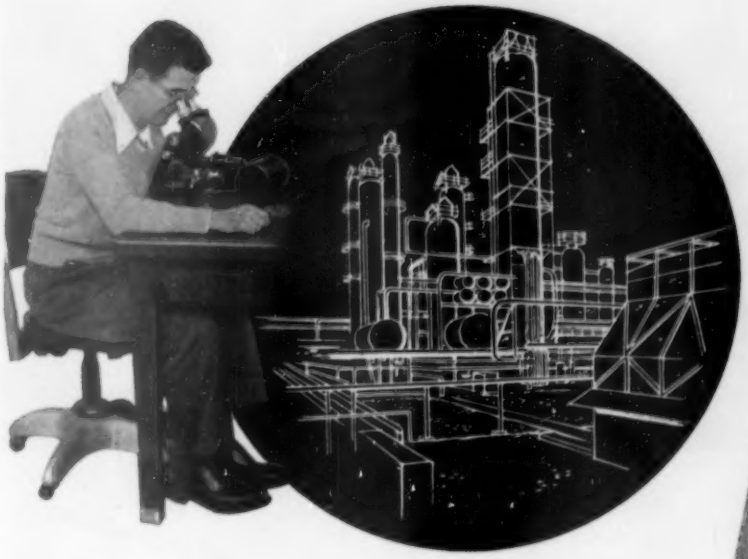
Whessoe, Ltd., Works: Darlington, County Durham

is corrosion costing you too much?



our job at Globe is to keep this costly problem at a minimum — through the use of GLOBE Steel Tubes, produced for your specific requirements!

THERE are over twenty-five basic grades of stainless steel tubing, variations of which add up to many more analyses which can be employed in solving your corrosion problems.

Globe's metallurgists and engineers help you minimize the expense caused by corrosive attack. By careful laboratory and field study of your processes and products, they will recommend just which of the many available analyses of Globe tubing is best suited to your job.

Globe's "one source" supply offers seamless and welded stainless, and seamless carbon and alloy steel tubes in a complete range of sizes and analyses. Write for the Globe General Catalog.

Producers of Globe seamless stainless steel tubes — Globeweld welded stainless steel tubes — seamless alloy and carbon steel tubes — seamless Globeiron (high-purity ingot iron) tubes — Globe Welding Fittings

GLOBE

STEEL TUBES CO.

Milwaukee 46, Wisconsin

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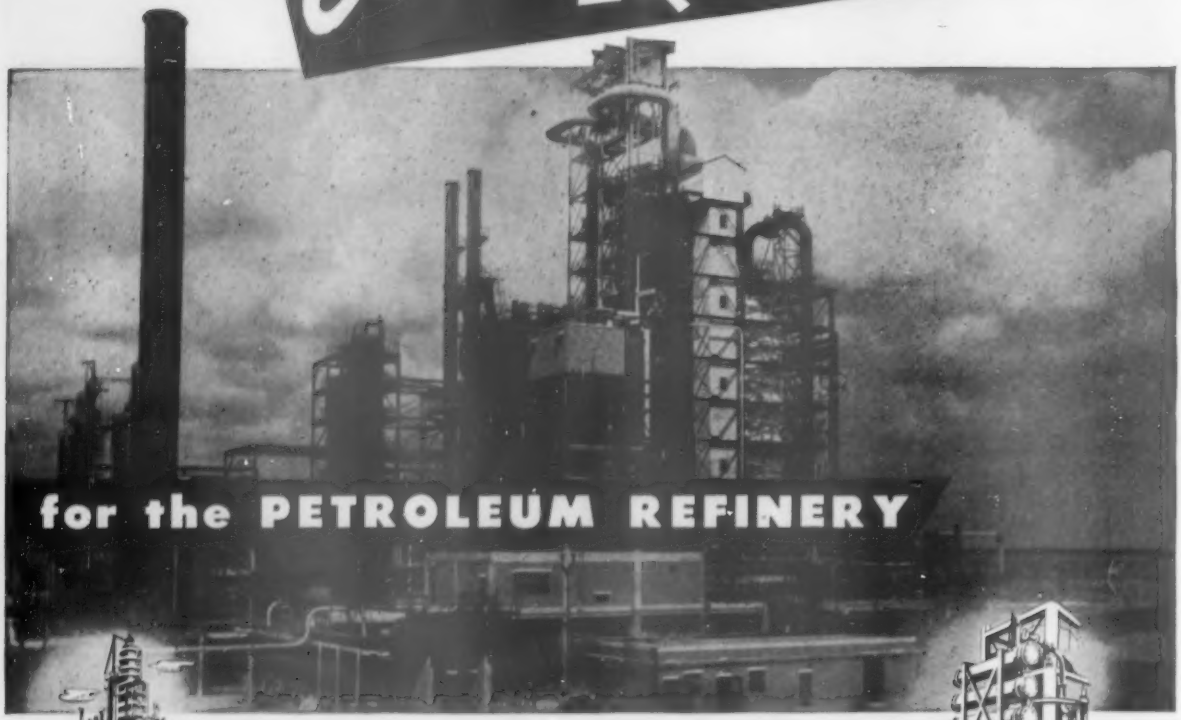
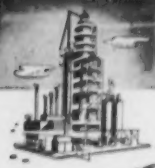
Essential EQUIPMENT





TOWERS—STILLS

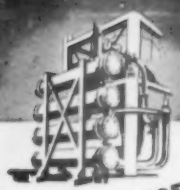
STEAM BOILERS

DROP FORGED STEEL VALVES AND FITTINGS

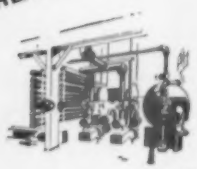
SELECT the process most suitable to your operating conditions and indicated future market requirements and then specify . . . Equipment by Vogt.

A wealth of research and engineering experience, combined with skilled operating personnel and exceptional manufacturing facilities, is incorporated in the wide variety of equipment we construct to all Codes.

Inquiries for detailed information on Vogt Products will receive prompt attention.



HEAT EXCHANGERS



REFRIGERATION MACHINERY

WAX PLANT EQUIPMENT

HENRY VOGT MACHINE CO., Inc.

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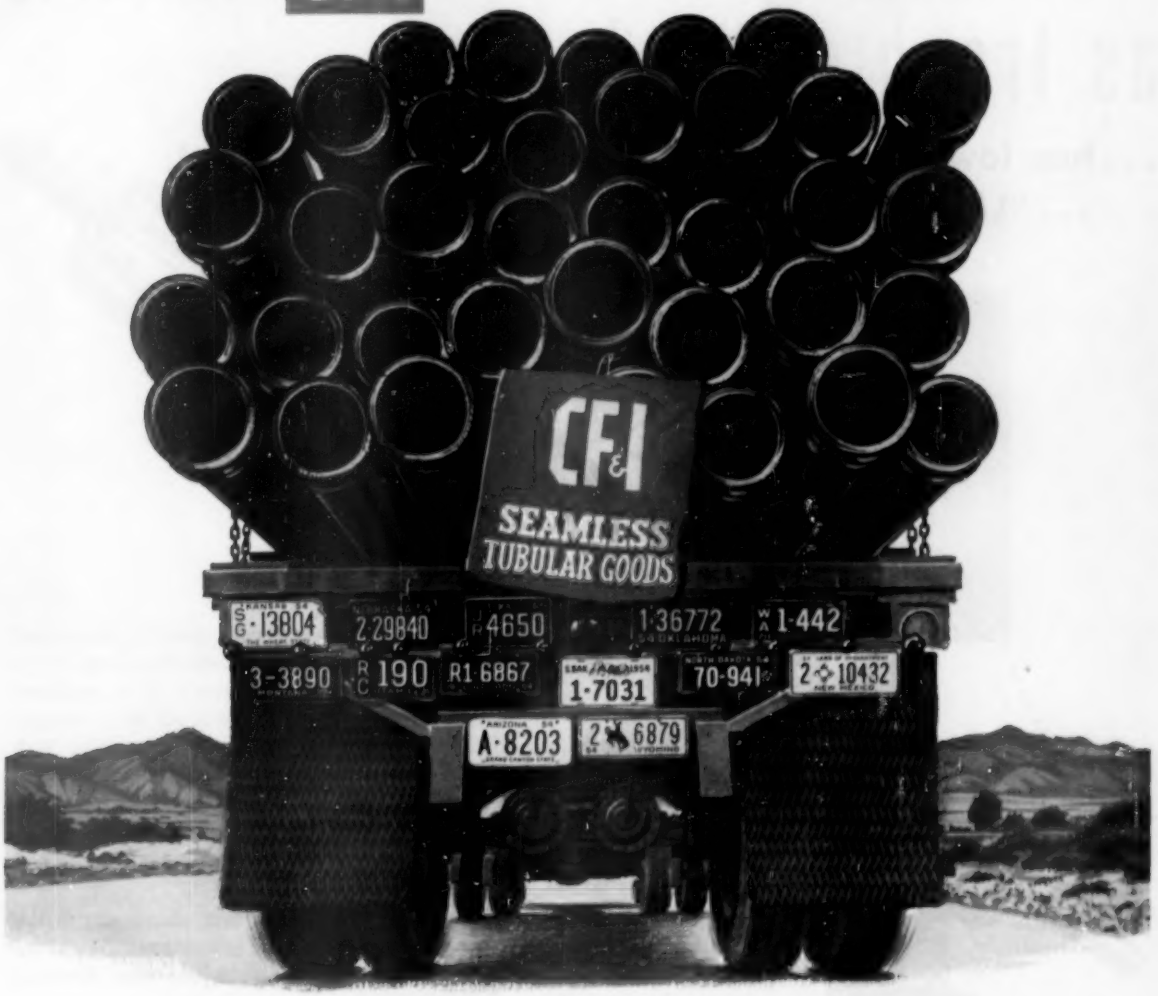
from the new CF&I **SEAMLESS TUBE MILL**



headin' for the oil country

Prompt and efficient service for the oil and gas industries of the Rocky Mountain and Southwest areas. That's the need that brought into being the new CF&I Seamless Tube Mill at Pueblo, Colorado—newest mill of its type located West of the Mississippi.

Here—centrally located to some of the largest oil and gas producing regions—the most modern facilities and machinery combine with step-by-step quality control to assure seamless casing and tubing that for precision and quality are unrivaled in the industry.

CF&I Seamless Oil Country Casing and Tubing meet API STD 5A specification—in sizes from 2⅜" O.D. through 9⅝" O.D.

CF&I TUBULAR PRODUCTS
THE COLORADO FUEL AND IRON CORPORATION CF&I
DENVER, COLORADO

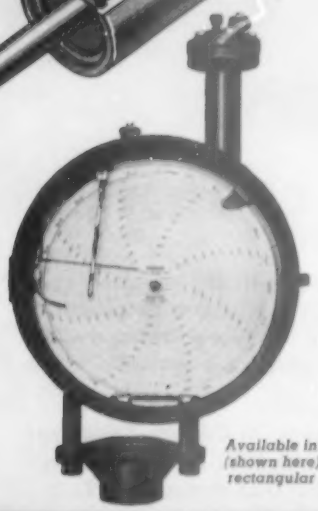
2519

You've never seen a meter bearing as trouble-free!

...has lowest torque under pressures to 5000 p.s.i.
..."Life-Lubricated" at the factory

This exclusive stainless steel Pressure-Seal Bearing is virtually frictionless, free from maintenance and leaks. O-Ring seals of a resilient, chemically inert material are retained in a unique mounting which assures minimum torque even under high static pressure. No metal-to-metal contact. No adjustments . . . no periodic lubricating. Bearing shaft provides direct mechanical connection between float and pen . . . no lost motion . . . higher sustained accuracy. Shafts are interchangeable . . . can be replaced if damaged.

Be sure to check all the advantages that contribute to the greater accuracy of the new Foxboro Flow Meters. Write for Bulletin 460. **The Foxboro Company, 6010 Neponset Avenue, Foxboro, Massachusetts.**



Available in round (shown here) and rectangular cases.

OTHER NEW BASIC ADVANCES

- **Precision Float Assembly** with stainless steel ball chain and collet-type clamp insures slip-proof, friction-free transmission of float motion to the recording pen.
- **Sure-Seal Check Floats** insure perfect seating; submerged in mercury to prevent frosting and fouling.
- **Union-coupled U-bend** eliminates gaskets; always lines up.
- **Calibrated Damping Plug** fully adjustable under pressure.

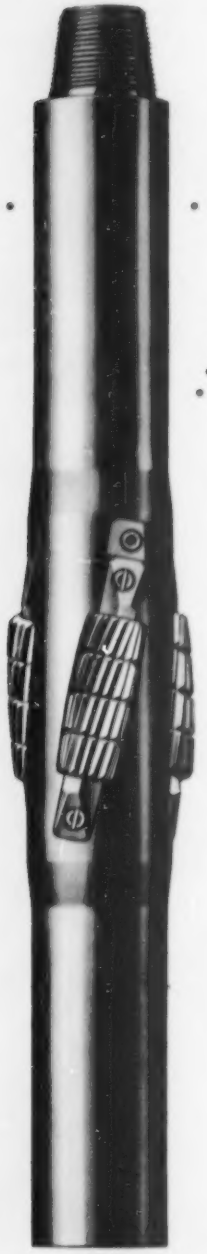
FOXBORO REG. U.S. PAT. OFF. **... First in FLOW METERS**

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

GRANT
OIL TOOL COMPANY

No. 1 of a series on how Grant specializes in just one job: Engineering the Tools that help you drill wells better.

This angle on reamers makes good sense – and better hole ...only Grant has it!



Model 1530
Regular Reamer

By angling the cutters on Grant Reamers *to the right*, you get three important advantages that make Grant the logical, sensible choice for reaming or stabilizing in all formations...

1. Grant's "angled right" cutters provide the shearing and cutting action that slices away the formation. A Grant always *cuts* its way through, producing a round, full-gauge hole.

2. By angling cutters *right*, Grant Reamers have a tendency to rise. You can't cork-screw the reamer into tight hole—an exclusive Grant feature!

3. With cutters angled to the *right*, a Grant Reamer requires application of the downward weight necessary for positive reaming action.

But right angled cutters are not all! There are *no welds* of any kind on this forged steel body, insuring maximum strength and ruggedness. All cutter parts subject to wear are components of one discardable assembly. A wrench is all you need to dress your Grant for another run. More sense-making, money-saving Grant features!

Cross section of Grant Reamer Cutter Assembly. Cutter pins and bushings are dove-tailed into the Reamer body so that they cannot come out under any conditions!

3 Blade Wall Scraper | Undereamer | Cushion Stabilizer | Casing Scraper | Model 6400-A Reamer New Bit Type

Whether you're reaming or stabilizing – or both – there is a Grant 3, 6 or 9-point Reamer and the proper cutter type for the job. To get the complete story, simply write for Bulletin 62, or ask the Grant field man in your territory for the full details.

Get the facts before you—today!

GRANT

OIL TOOL COMPANY

Main offices and Plant: 2042 East Vernon Avenue, Los Angeles 58, California

Extra Strength...for Extra Depth

NATIONAL *Seamless*

- DRILL PIPE
- CASING
- TUBING

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Tubular Department
Wherever and whenever you need pipe, the Tubular Department of Mid-Continent Supply Company is at your service . . . with material in stock or with engineering assistance.
H. D. Powell is tubular manager. F. J. Spurlock is division tubular manager. R. L. Harris is in charge of Canadian tubular sales and T. H. Shults is in charge of world-wide export tubular sales.

WORK it hard . . . work it deep . . . you can rely on "National Seamless" oil field tubular material . . . made by National Tube Division of United States Steel Corporation.

Its strength is your insurance against fatigue and twisting action. Its high collapse resistance is your best defense against deep hole trouble.

Seamless construction and the finest of steels from the world's largest pipe producer are your guarantee of unsurpassed performance. For complete information write to Tubular Department, P. O. Box 189, Fort Worth, Texas.

MID-CONTINENT
Supply Company
MID-CONTINENT BLDG. • FORT WORTH, TEXAS

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

why NATIONAL can meet your

PUMPING UNITS
most exacting needs...

More than 20,000 National Pumpers have been put into service to meet the most exacting needs of oil men everywhere. Here's why:

1. They are ruggedly built and precision-engineered
Jig-welded construction, reinforced at all points of extreme stress, assures ample strength. Precision engineering provides for positive alignment and interchangeability of all component parts.

2. They are easy to assemble and adjust
The simple, compact design of National Pumping Units makes possible easy field assembly. Every component section, from main base to walking beam, has adjustment features which guarantee true alignment to the well. Counterweights are designed for easy, safe adjustment by one man at ground level (see below).

3. They cost less to operate and maintain
Needle type anti-friction saddle and pitman bearings, self-aligning wrist pin bearings and pressure relief valves to prevent over-lubrication are typical of the many quality features which provide for efficient, low-cost operation. Because National Pumpers are individually engineered to perform dependably under specific load requirements, they require a minimum amount of maintenance.

4. They are exceptionally long-lived
National Pumpers have an outstanding reputation for giving long, non-stop service under all conditions. The extra stamina built into them provides for smooth operation—even when depth ratings are exceeded.

5. There is a model to economically suit every load and field condition
National's complete line of pumping units ranges from a 3,200 pound API rated walking beam unit to a 32,400 pound API rated walking beam model. A total of *38 combinations*, in beam and crank counterweighted types, are available, and you can easily select the exact unit to best handle each job.

Facts and figures on the unit that's best for your well are readily obtainable from the National Supply Representative in your area. Why not let him show you how it pays to standardize on National Pumping Units?

THE NATIONAL SUPPLY COMPANY
PITTSBURGH 30, PENNSYLVANIA

First in quality...
First in supply service
in oil country everywhere

Division Offices: Denver; Ft. Worth; Houston; Pittsburgh; Tulsa; Torrance
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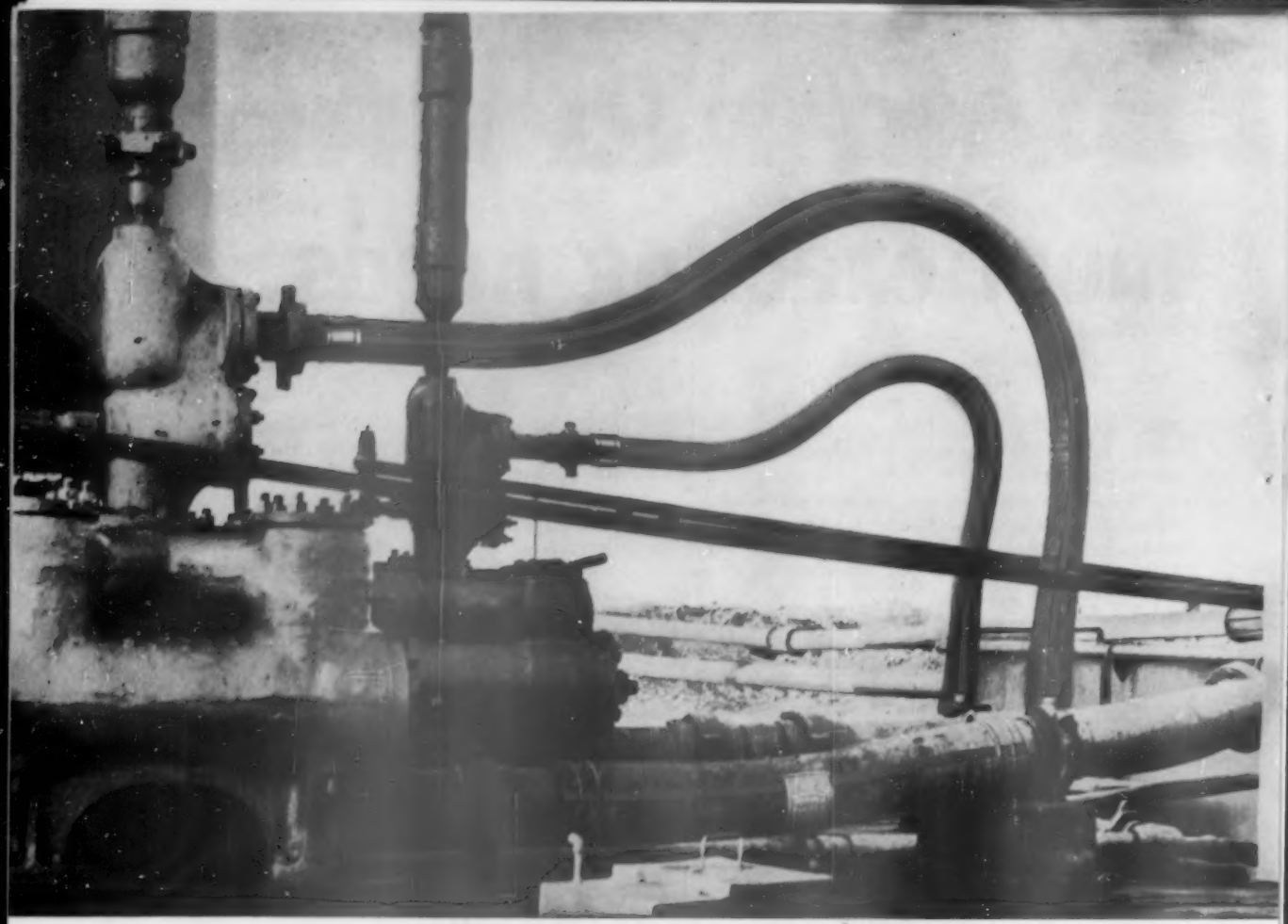
Export: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; River Plate House, 12 South Place, London E.C. 2

NATIONAL BLUE PRODUCTS

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT **SPANG STEEL PIPE** **SUPERIOR & ATLAS ENGINES**

National gear reducers, precision-built in single and double reduction types, are run-in under load at the factory to assure quiet and efficient operation in the field. All moving parts are cascade lubricated, and all extended shafts have weather-tight oil seals. Sediment chambers in gear cases can be quickly cleaned by means of easily accessible magnetic drain plugs.

Reduced power consumption and minimum stress on the unit and rods are made possible with National's patented eccentric type disc crank. With its rim-locked counterweights, it is safely and easily adjustable by one man at ground level. The weights slide around the track to any desired position, allowing the very maximum in accuracy of counterweight effect and degree of lag and lead.



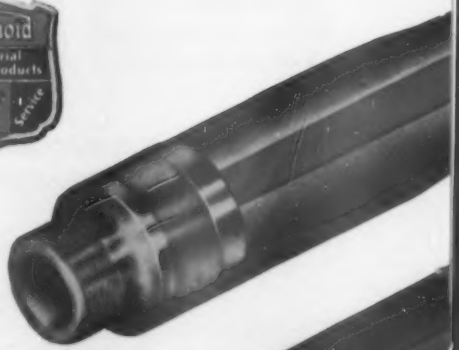
Thermoid Oil Field Products Are Built for Rugged, Continuous Service ...to Cut Your Drilling Costs

Thermoid Flexible Discharge Units provide rugged high pressure connections between mud pump and standpipe . . . eliminate sharp angle fittings, thus reducing turbulence and loss of pressure. Easily installed, they take up misalignment, save rig up and tear down time, resist vibration, cut time lost due to pipe breakage and loosened connections. Full flow pressure seal couplings are built in. Supplied in diameters of 2½", 3" and 3½" . . . standard lengths. Pre-tested to 5000 psi to assure blowout-proof performance.

Thermoid Mud-Flo Suction Hose absorbs pumping vibration and affords maximum flexibility. Thick inner tube and heavy galvanized wire reinforcement imbedded in rubber compound prevents collapse and provides unobstructed flow. Permits changing position of intake without changing connections. Cover withstands abrasion and weathering. Ends are sealed to help keep out moisture.

To keep your costs down, be sure you specify Thermoid Flexible Discharge Units and Mud-Flo Suction Hose.

Mid-Continent Offices and Warehouse, Houston, Texas
California Offices and Warehouse, Los Angeles



Flexible Discharge Unit

Mud-Flo Suction Hose

SEE OUR CATALOG IN THE COMPOSITE CATALOG

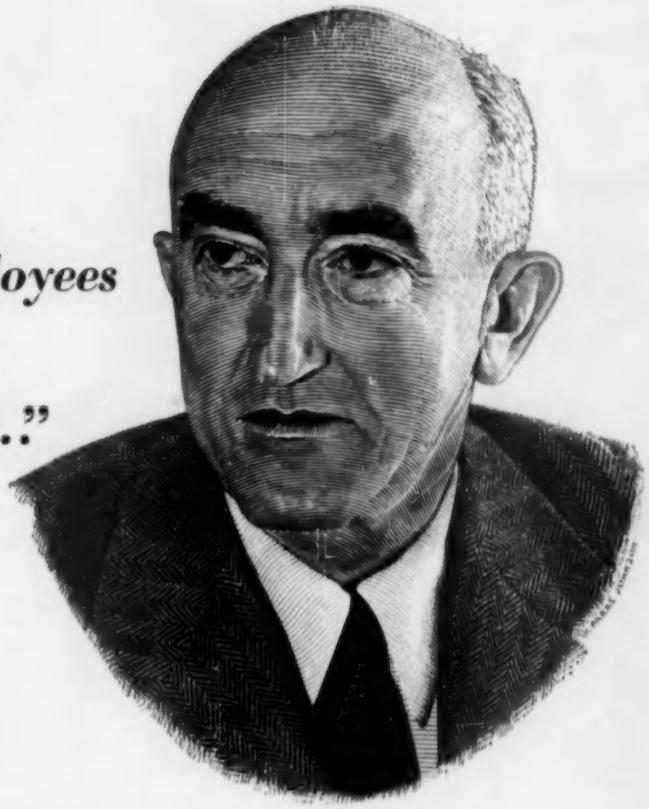
Powerflex Rotary Hose • Trioflex Slim-Hole Rotary Hose • Mud-Flo Slush Pump Hose • Flexible Discharge Units • F.H.P. and Multiple V-Belts • Oil Country Flat Belting

Thermoid

Wire Line Turn Backs • No-Wip Line Savers • Stuffing Box Rings • All Types of Hose • Molded Specialties • Brake Blocks

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

"Boeing's 59,000 employees feel closer to the company..."



WILLIAM M. ALLEN
President
Boeing Airplane Company

"Boeing's 59,000 employees feel closer to the company since our recent successful person-to-person payroll savings drive in the Seattle and Wichita Divisions. Through letters and personal observations many employees have told us they have a greater sense of being a part of the company—that Boeing is interested in the welfare of each and every man and woman on the payroll."

That's the way it is with Payroll Savers. With the realization that systematic investment in U. S. Savings Bonds is a sure road to the down payment on a home, comfortable retirement, or other objectives, comes a better appreciation of a man's job and his company.

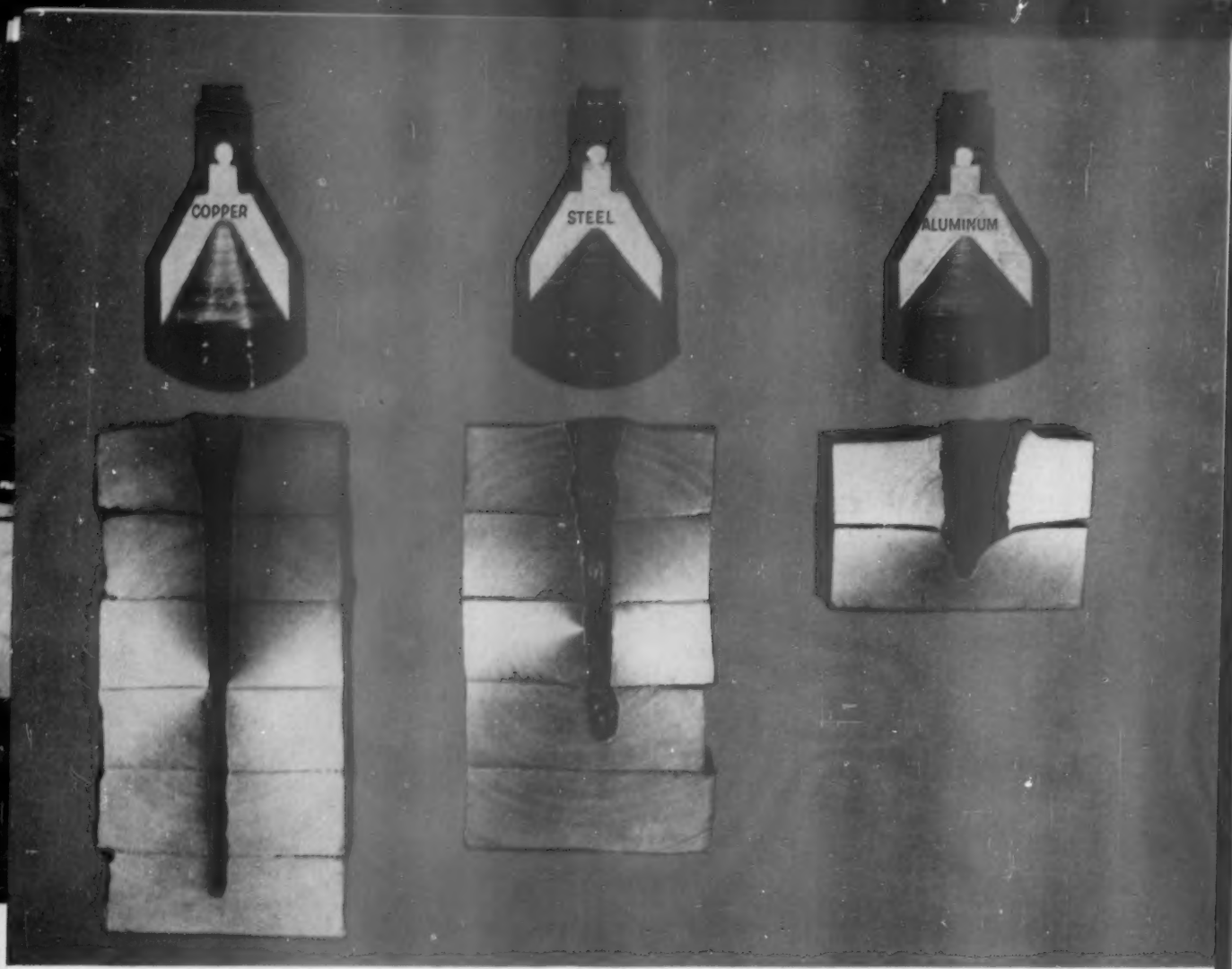
To most Payroll Savers, a day's absence from work means just that much out of his take-home savings. And he no longer takes chances, because he wants to stay off the accident list. He looks for better and quicker ways to do his job—promotion will mean more dollars for Savings Bonds. As a stockholder in America he takes a better interest in national affairs, the sound dollar, and economic stability.

91% of Boeing's 65,000 employees—more than 59,000 men and women—are Payroll Savers, as a result of a person-to-person canvass that put a Payroll Savings Blank in the hands of every Boeing employee. Certainly that is a high percentage of which Mr. Allen may well be proud. But it is not exactly unique. A number of the 45,000 companies which have the Payroll Savings Plan have 90% participation; many are in the 80% to 90% group, and many more are in the 60%, 70%, 80% class. In every case, these high percentages followed a person-to-person canvass that put a Payroll Savings Application Blank in the hands of every employee.

If less than 60% of your employees are Payroll Savers, do something about it. A phone call, telegram or letter to "Savings Bond Division, U. S. Treasury Department, Washington, D. C.," will bring prompt assistance from your State Director, U. S. Treasury Department. He will help you install, or revitalize a Payroll Savings Plan, through a simple, person-to-person canvass which your employees will be glad to conduct.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

THE OIL AND GAS JOURNAL
TULSA 1, OKLAHOMA



Why you get consistently deeper penetration with Du Pont Jet Perforators

Research pointed out the best liner material

Nothing was left to chance in the development of the Du Pont Jet Perforator. With deep penetration the objective, every vital factor was analyzed and evaluated—each under constant conditions—to determine the most practical design.

One such test involved selection of the liner material. Copper, steel and aluminum were among the metals studied. The photo above shows the result. The copper cone pierced 5½". . . about 2" deeper than the steel cone and three times as far as the aluminum one. This proof of penetration gave Du Pont the answer they needed, and that's why today all Du Pont Jet Perforators are copper-lined.

All this extensive research has served to make Du Pont Jets the most effective oil-well perforating device on the market. They give positive perforation, shot after shot . . . even three strings of casing and well into the surrounding formation. And Du Pont Jet Perforators perform efficiently even at 300°F. If oil is present, you can depend on these perforators to reach it!

Leading service companies agree that Du Pont Jets give deep, consistent penetration. Have them used on your next perforating job. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

DU PONT

JET PERFORATORS

Product of Du Pont Explosives Research

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Workman pours 25 lb. bags of phenolic resin spheres into hopper.

Diagram at left shows system for introducing spheres into oil storage tank.

In one hour, oil tank gets new vapor-sealing floating blanket

At an oil station in Texas recently, it took less than an hour to install a covering of Microballoon*spheres on the oil in a 10,000 barrel tank. Half an inch thick, this floating blanket will cut evaporation loss 80-90 per cent.

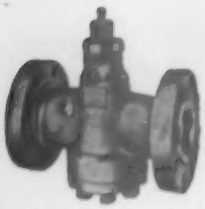
The tiny hollow spheres of BAKELITE Phenolic Resin, microscopic in size, resemble finely ground reddish-brown flour. Pumped in with the oil, they float to the surface, forming a cover that rises and falls with the oil level, keeping it sealed. Cost may be repaid within a year by savings in evaporation loss.

Learn more about this new method of stopping evaporation loss. Write Dept. XO-64 for free booklet describing BAKELITE Phenolic Resins for oil evaporation control.

*Trade-mark Standard Oil Company (Ohio).

BAKELITE
TRADE-MARK
PHENOLIC RESINS
TRADE MARK

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario

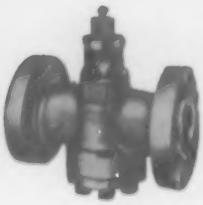
THIS  is a remarkable valve, as

Lubricant goes in through

grooves in the plug and body

three things—it lubricates the seat

acts as a hydraulic jack to keep the

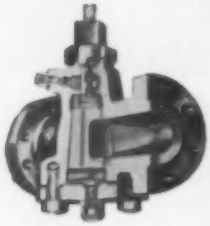
this valve  is safer, because it can

because lubricant stops seepage

because, by eliminating friction

most valves. What kind of valve is it?

by **ROCKWELL** Manufacturing Company,

you will quickly see when you look inside the stem and is forced through  . . In service, this lubricant does —it seals off the seating area . . . and it plug in position to turn easily. Consequently always be operated in an emergency, and, before it starts. It's also more economical and abrasion, lasts much longer than Naturally, it's **ROCKWELL-NORDSTROM,** Pittsburgh 8, Pennsylvania.

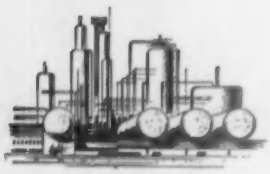
Canadian Licensee:
Peacock Brothers Limited

Why Alloy Steels?

Carbon steels are better today than ever before. A major producer of both carbon and alloy steels, Republic is aware of this fact. Even so, there are limits to the application of carbon steels. Machine design may restrict the size of a part. High strength may be an essential combination with light weight. Sometimes surface hardness and ductility must be held within the limits. Such are the applications in which *only* alloy steels can perform definite tasks with certainty of results at lower ultimate cost.

Take large sections—where hardness must be carried deep into the steel. Heavy crankshafts, connecting rods, piston rods, large gear and axles are examples. Here alloy steels *are necessary,* and the cost low in proportion to results. With carbon held constant, depth-hardening quality increases as the alloy content is increased.

Sometimes weight and space limitations demand that smaller sections carry heavier loads safely. For safety's sake, the answer *must be* alloy steels. Under repeated stress, high tensile strength and hardness do not necessarily indicate high fatigue properties. The load-carrying ability of a steel depends upon its alloy constituents and the form of the structure at the time it is bearing the load.



A problem of high pressures at elevated temperatures may present a problem. But alloy steels *have proved* their high resistance to creep. Some stainless alloys maintain high strength up to 1800° F. They resist oxidation—therefore do not lose their strength appreciably through reduction of section.

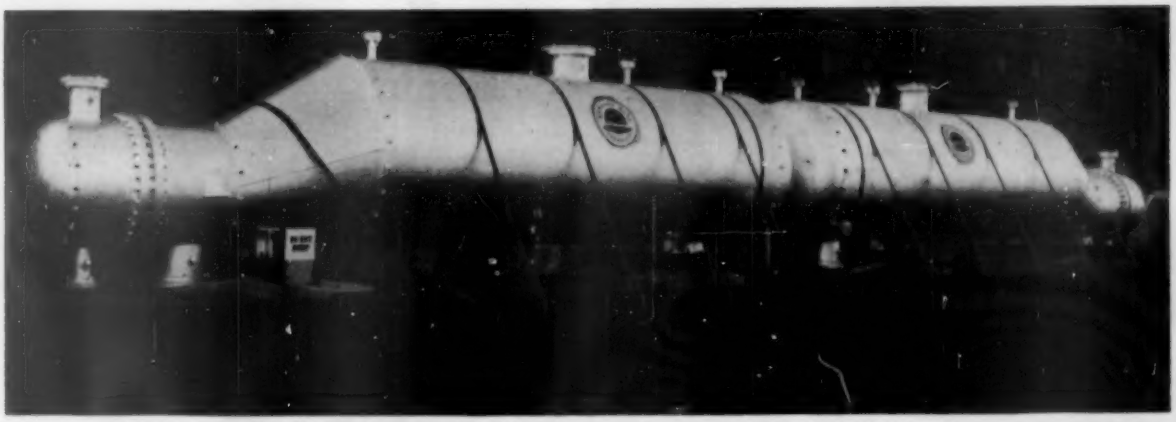
High elastic properties and strength may be the primary requirement, especially for welded structures. Weight reduction may be most important. In these applications, low carbon complex alloy steels *offer distinct advantages.* Such alloy steels at equal or higher yield points show low weld-hardening tendencies. Resistance to corrosion is improved. So is ductility of the weld. And retention of toughness at sub-zero temperatures, as well as creep resistance at high temperatures, is better.

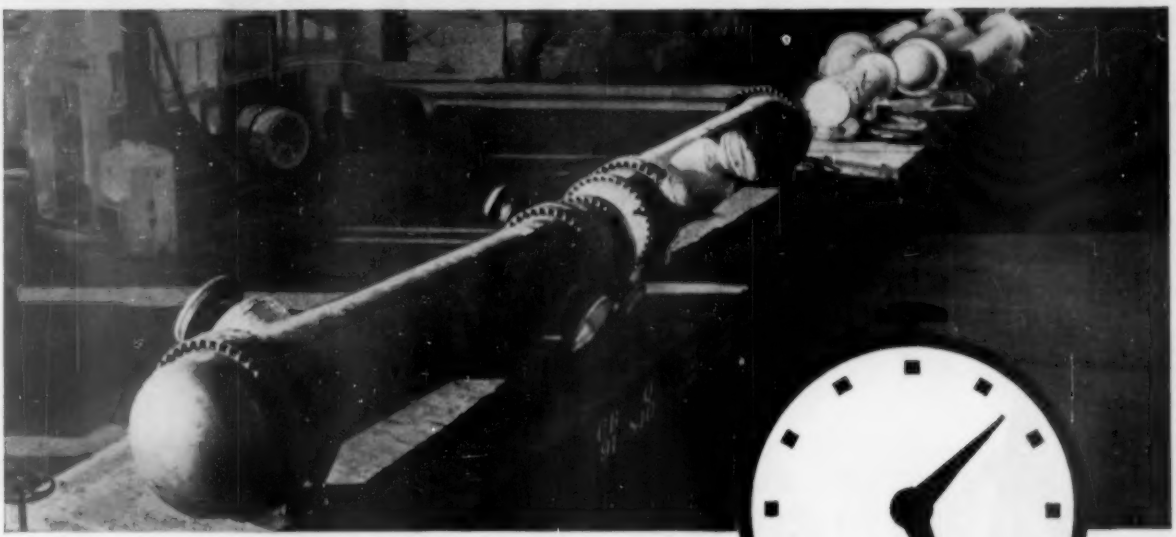
To help you get the most from alloy steels, Republic offers you its unique 3-D Metallurgical Service. You benefit from the combined experience and coordinated efforts of three groups of highly-trained men—(1) the Republic Field Metallurgists; (2) the Republic Laboratory Metallurgists; (3) the Republic Mill Metallurgists. All work hand-in-hand to help you do the job you want done with alloy steels at the lowest possible cost. Ask us about this service.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Bldg., New York 17, N. Y.

REPUBLIC ALLOY STEELS

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Bars, Wire, Pig Iron, Steel and Plastic Pipe, Bolts and Nuts, Tubing





Ross Exchangers
REACH YOU FASTER!

Leaving the Kewanee, Ill. works, these Ross Exchangers and Kettle Type Reboilers will travel the shortest possible routes to their new owners. Naturally!

But that's merely a matter of days or hours . . . hardly enough to talk about when one considers the time that Kewanee-Ross can often by-pass in engineering and fabrication.

Yes, it's a fact that Ross Exchangers and Condensers can stop the clock . . . *in a number of ways* . . . from the time you first consult with a Kewanee-Ross engineer until your product is delivered. (1) A great variety of standardized designs, in numerous sizes, often provide immediate solutions. (2) No matter how individualized, specially engineered units can frequently utilize many standard components and design features. (3) Unique experience over many years, in meeting greatly diversified requirements, is bound to include a "case" that closely parallels yours.

Make sure that your next exchangers and condensers reach you faster by consulting Kewanee-Ross early.

KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
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Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

Oil Well Tubing
AS SMALL AS 3/4 INCH
in Stock Now

Sizes ¾" — 1" — 1¼" — 1½".

Finished tubing now available from stock for the first time.

All grades — H-40 — J-55 — N-80.

Upset and Non Upset.

Threads and couplings in accordance with API specifications 5A tentative.

Published prices.

Technical information on setting depths.

Carload quantities and less carload quantities F.O.B. Houston or Tulsa stocks.

TEX-TUBE INC.

1504 OLIVER ST.
CH-6411
HOUSTON, TEXAS

ALL FORGED STEEL
EDWARD VALVES FOR THE OIL INDUSTRY

Fig. 158 Globe

TOP PRESSURE GLOBE AND CHECK VALVES

Ratings — 2" size 7500 lb WOG Smaller sizes 6000 lb WOG

All forged globe stop valves for positive shut-off or accurate pressure control, also dependable ball check valves for protection against sudden reversal of flow, in pressure systems up to 7500 psi. Globe valves have EValloy 13% chromium stainless steel seat, disk and stem. Check valves have EValloy seat, high carbon stainless steel, wear resisting ball. Suitable for liquid or gas services. Alloy steel body used on 2 in. size. Check valves may be installed in horizontal or vertical lines.

Size range: ¼", ⅜", ½", ¾", 1", 1¼", 1½" and 2".

Fig. 160 Horizontal or Vertical Check

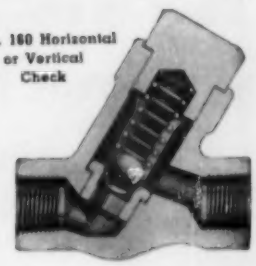

Fig. 444 Globe

GLOBE AND ANGLE VALVES

Ratings — 2000 lb WOG 850 lb at 750 F

All forged—all purpose valves ideal for almost all services where small forged steel valves may be used. Streamlined body and rugged bonnet both forged steel. Fig. 444 with union bonnet in sizes 1 in. and smaller. Fig. 448 with bolted bonnet in sizes 1¼, 1½ and 2 in. Bronze bushed yoke, simplified bolted gland design for easy packing adjustment. EValpak high pressure-high temperature die-molded packing. Stem, disk and seat of EValloy 13% chromium stainless steel. Available with screwed or socket welding ends. Angle valves designated Fig. 445 and Fig. 449.

Size range: ¼", ⅜", ½", ¾", 1", 1¼", 1½" and 2".

Fig. 448 Globe

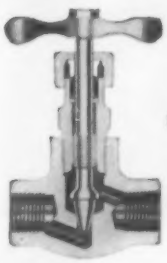

Fig. 152 Globe

GAGE VALVES

Ratings — 4000 lb WOG 600 lb at 750 F

Drop forged, instead of barstock, steel valves for gage, meter, dead-end, instrument and other small lines. Taper threaded bonnet joint. Long taper semi-needle type stem-disk for close regulation and tight seating. Fig. 152 has carbon steel body with EValloy 13% chrome stem-disk. Also available in all 13% chrome stainless steel and in all 18-8 stainless steel. Sizes ¾ and 1 in. have union bonnet. 152J has male inlet, female outlet. Angle valves designated Fig 153 and Fig. 153J.

Size range: ⅛", ¼", ⅜", ½", ¾" and 1".
(Fig. 152J available ½" size only.)

Fig. 152J

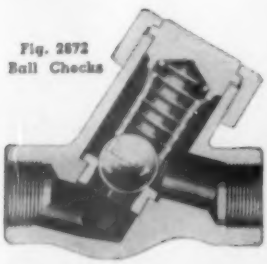

Fig. 2872 Ball Checks

BALL AND PISTON CHECK VALVES

Ratings — 1440 lb WOG 850 lb at 750 F

General service small check valves that give freedom from shock or excessive vibration, yet seat quickly and tightly upon flow reversal. Size 1¼ in. and larger with bolted cover. Sizes 1 in. and smaller with union cover. Corrosion resistant trim in all designs.

Size range: ¼" to 2" inclusive.

Fig. 4638 Bolted Cover Checks

ROCKWELL-BUILT EDWARD VALVES

For Mudline Service Use the EDWARD MUDWONDER — The All-New Alloy Steel Valve

Edward Valves, Inc.
Subsidiary of ROCKWELL MANUFACTURING COMPANY
1492 West 145th Street
EAST CHICAGO, INDIANA

EDWARD BUILDS . . . a complete line of forged and cast steel valves from ¼" to 16" in GLOBE and ANGLE STOP, GATE, NON-RETURN, CHECK, BLOW-OFF, STOP-CHECK, RELIEF, HYDRAULIC, INSTRUMENT, GAGE and SPECIAL DESIGNS for pressures up to 7500 psi with pressure-seal, bolted, union or welded bonnets and screwed, welding, or flanged ends . . .

FOR THE OIL INDUSTRY Write For Catalog 105

Your men will travel **light**...and **fast** installing KRALASTIC® pipe for gas

How fast? *One major west coast home development company recently installed 4200 feet of 2" Kralastic pipe in just one week—with a crew of only two men!* They completed *50* home services from a steel main in the time usually required for just *10* services with standard pipe!

With Kralastic pipe, one man easily carries all that's necessary for the average home service—pipe, fittings, saw blade, solvent, and brush.

No particular skills needed, either. Often he can snake Kralastic pipe through existing lines, eliminating costly, time-consuming ditching. And he *solvent welds* Kralastic fittings in seconds.

No rust or rot! Kralastic pipe is impervious to electrolytic action and destructive soil chemicals. It retains its high impact strength over a wide range of temperatures.

More? The installed cost of Kralastic pipe is *far less* than other types of pipe. And Kralastic pipe will last *far longer!*

See how you can save with this tough plastic pipe that has proved its unmatched advantages for natural gas, water, brine, oil, and many other applications. *Write us today.*

50th ANNIVERSARY 1904 1954 NAUGATUCK CHEMICAL

Naugatuck Chemical

Division of United States Rubber Company

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"THE BRAND OF PROGRESS"

By Heat Exchanger Specialists

▲SYNOPSIS OF AD #8: To assure complete vapor and fluid-tight metal-to-metal tube sheet joints, Western Supply utilizes 100% application of controlled torque tube rolling. The elecronically-controlled tube expander eliminates the human element guaranteeing a positive "set" on each and every tube-to-tube-sheet. Thus, expansion is uniform . . . distortion of the tube or tube sheet is eliminated.

ninth in a new series of advertisements

X-RAY
an inside look at
WESTERN HEAT
EXCHANGER
quality!
Recent advancements in the process industries have been typified by increased temperatures and pressures. Alloy heat exchanger fabrication today requires vigilance in quality control to assure that the units are as free from human defect as it is possible to make them.
In the Western welding shops one such quality control method is X-Raying of critical welds.
This is accomplished not only where accepted fabrication codes require, but also as periodic checks on the welding performance of each worker.
This same close examination of quality extends into Western's other departments—raw materials, machining, assembly and testing.
Because of the rigid quality control procedures, you can have full confidence in the construction of all Western exchangers.
WESTERN
HEAT EXCHANGERS
WESTERN SUPPLY CO
P. O. BOX 1888 • TULSA, OKLAHOMA

They Say—

Dwindling Resources

"We are undergoing a historic transition from a minerals surplus to a minerals deficient nation. It is apparent then that especially in oil-producing and refining operations, every effort must be directed to securing the best possible return from remaining resources . . ."

A. C. Monteith, engineering vice president of Westinghouse Electric Co. and president of the American Institute of Electrical Engineers, at the annual meeting in Tulsa of the A.I.E.E. Petroleum Committee.

Coal Gasification

"The complete gasification of coal will insure an unlimited gas supply for the foreseeable future. The institute already has developed a process of gasification of coal without coke, tar, or other byproducts."

Capt. E. S. Pettyjohn, Illinois Institute of Technology, at the institute's annual meeting in Atlantic City.

More Compression, Less Cost

"Let's assume that the top compression ratios will be about 10 to 1 in 1958. Your car then will need a gasoline with an octane rating close to 100. Probably you will pay a cent or so more for it if economic conditions generally don't change. But you'll be saving money. Here's why:

"We estimate that 10-to-1 engines will burn gasoline 20 per cent more efficiently than present engines. But at the rate we are using gasoline now — 45,000,000,000 gal. a year for both passenger cars and commercial vehicles—a gain of only 1 per cent in efficiency would save the nation's motorists $91,000,000 a year. That's a big cash saving, and it's something more. It means that higher-compression engines using high-octane fuels will be doing a big job of conserving our petroleum resources."

Eger V. Murphree, president of Standard Oil Development Co., in the October 15 issue of Collier's.

Australia "Most Attractive"

"As a potential province, I consider the Exmouth Gulf basin one of the most attractive untested areas I know in the world. Some of these are textbook structures and if they had been situated in West Texas would have been drilled 25 years ago."

Frank A. Morgan, chief geologist to Ampol Exploration, Ltd., in a statement made shortly after arriving recently in Australia.

Designing a Pipeline

"To maintain a competitive position in the fuels market, the pipeline companies now are faced with the everlasting responsibility of designing their transmission facilities with due regard to economic factors not heretofore given prime consideration.

"Basically, the economic factors affecting engineering design appear to be the character of the market to be served and development of the load

"Let's take a close look at seals," advises Scottie.
Check construction of your proposed Traveling Block.
Positive grease seals eliminate undue loss of lubricant, stop entrance of grit, sand and foreign material into bearing cavity.
Johns-Manville "Klipper" seals on all McKissick Traveling Blocks offers positive protection.
McKISSICK
McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

OIL MEANS HEATING

The baker's oven . . . heat for our homes . . . the foundry's furnace . . . ship's engines . . . are fired with energy from petroleum. Every few minutes, night and day throughout the year, a Schlumberger crew completes another operation for the oil industry. This wealth of experience is assurance that you will receive the best in men and materials when you call Schlumberger.

. . . and Schlumberger means Service

Schlumberger Well Surveying Corp. • Houston, Texas

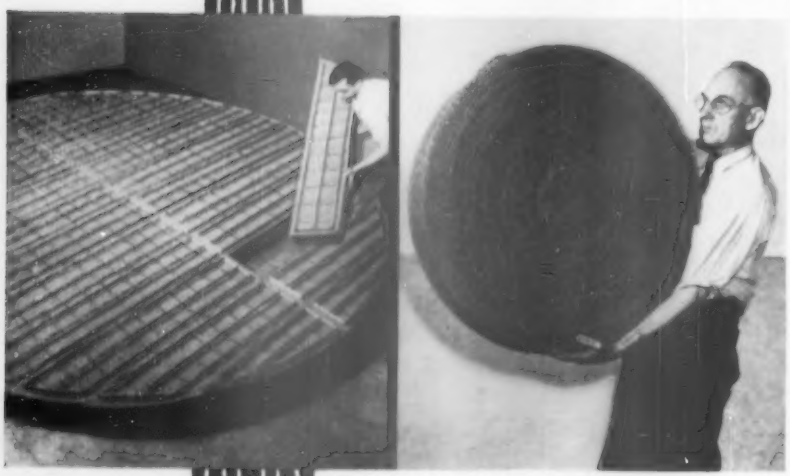
Internal **TRAFFIC CONTROL** in your **PROCESS VESSELS** with **YORKMESH DeMISTERS**

There's a green light for vapor and a stop for entrained liquid when Yorkmesh Demisters are on the job providing internal traffic control in your process vessels. Designed and constructed to effect clean separation between liquid and vapor, even at velocities which may be considered excessive, Yorkmesh Demisters improve the performance and increase the throughput capacity of vacuum towers, distillation equipment, scrubbers, gas absorbers, knock-out drums and other process vessels handling both liquid and vapor phase materials.

Easily installed in new or existing equipment these specially knitted fine wire mesh demisters provide highest efficiency at lowest cost, and are available in a wide range of corrosion resistant materials. To find out how Yorkmesh Demisters can improve the performance of your process vessels, write for Bulletin 16.

YORK

OTTO H. YORK CO., INC. 6 Central Ave., West Orange, N.J.



above left: sectional construction
above right: one piece construction

factor; availability and economics of gas storage fields; economic determination of line size versus ultimate installed horsepower; and careful predetermination of the pipeline determination . . ."

William B. Poor, of Ford, Bacon & Davis, New York engineering firm, at the New York convention of the American Society of Civil Engineers.

Find It, Then Shut It In

". . . The free world produced a record total of 2.2 billion barrels of crude oil in the first 6 months of this year, more than 4 per cent over the comparable output of a year ago. This is an outstanding record for the free-world nations which now are producing nearly 90 per cent of the world's total crude oil supply—but it is distressing to find that the United States failed to participate in this increase . . .

"This situation clearly illustrates one of the most important problems that the American petroleum industry faces today: the problem of underproducing, of developing wells and then being forced to shut them in in order to accommodate the oil coming into this country from foreign areas . . .

". . . We believe that excessive imports must be curtailed, thus encouraging the domestic oil industry constantly to find and develop new fields in the Western Hemisphere. Only then will our petroleum productive capacity be capable of dealing with any challenge we may be forced to meet."

Reese H. Taylor, president of Union Oil Co. of California, in a letter to employes.

More Control Threatens

". . . Already independent producers stand in the position of being classed as public utilities if they make sales of gas which passes into interstate commerce for resale. The returns of public utilities are strictly limited, both as to percentage of earnings and as to the properties upon which a return may be claimed . . . The properties permitted to be included in the rate base are only those 'used and useful' for performing service.

"If the FPC now applies this rule to the facilities used in making interstate sales of gas, a great many of the properties actually necessary to gas production may be excluded. Or, if the inclusion is a broad one, it will mean complete control by the FPC of a producer's facilities. Since oil and gas often are produced together, federal control of the facilities of oil production as well as gas production would be inescapable . . ."

Editorial in the Fort Worth Star-Telegram.

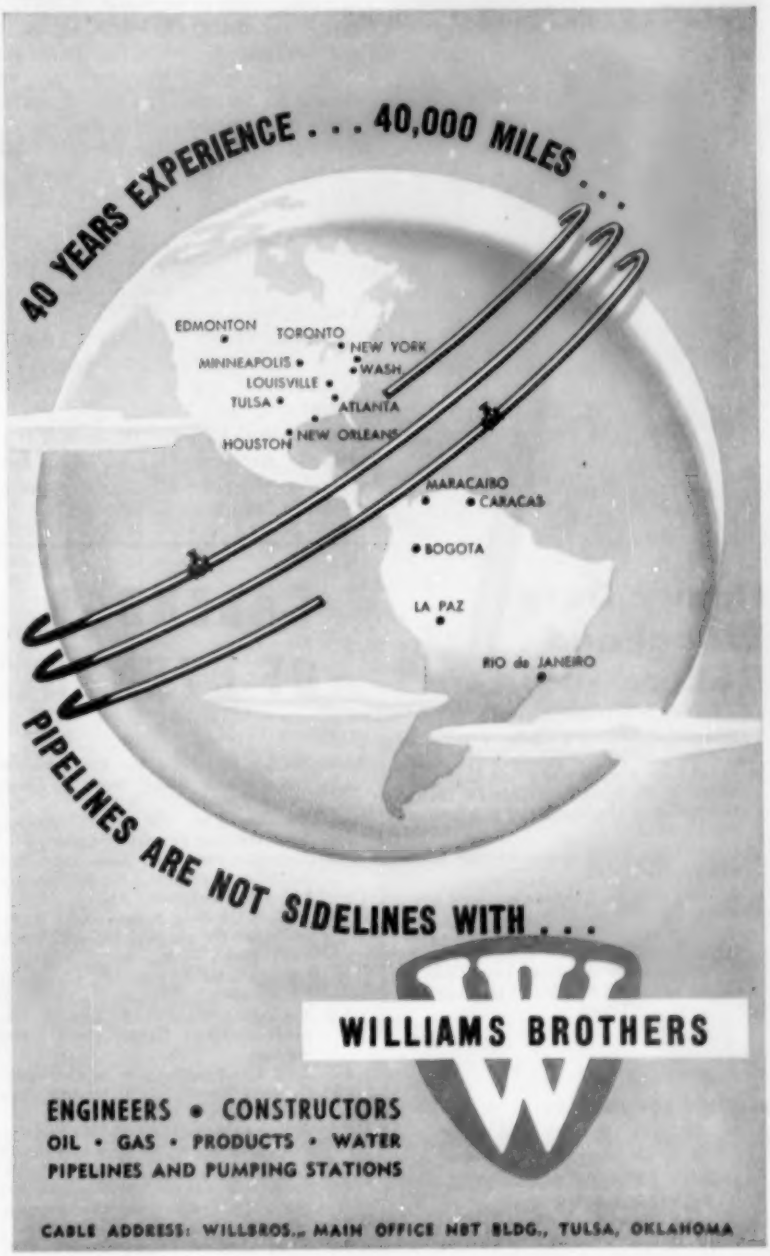
Two Boards in Texas

Dear Sir:

I am writing this to call attention to errors in your article "Texas Land Auction Set" on page 119 of your issue of October 4 . . .

All sales of oil and gas leases on those lands set aside for the benefit of the University of Texas Permanent Fund are under the jurisdiction of the Board for Lease of University Lands, which consists of two members of the board of regents of the University of Texas and the commissioner of the General Land office of Texas. Bascom Giles, who is the commissioner of the general land office, is currently chairman of this board for lease.

"The Texas School Land Board . . . is an entirely separate and distinct administrative body set up to handle those lands which belong to the Texas Free



Heavy Duty Wheel and Roller

★ Positive clean-cutting action.
★ Hooks on pipe easily . . . tracks perfectly . . . sturdy malleable frame formed to fit the hand and guaranteed warp-proof.
★ High alloy steel cutter wheels leave practically no burr.
★ Rollers in hook provide a square base when starting tool on pipe. Cuts ⅛" to 2" pipe . . . with speed and ease! Order through your supply house. Write for new catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio.

KEEP ON THE LEADER!
TOLEDO
POWER PIPE MACHINES
POWER DRIVES
PIPE TOOLS

Public School Funds. There is no connection between the two boards other than that Commissioner Giles is a member and chairman of both boards . . .

Berte R. Haigh
Geologist in charge
University of Texas
University Lands-Geology

Meeting the Demand

". . . Our company in recent years has undertaken a large investment program in order to meet the increasing demand for petroleum. Very substantial expenditures have been made, and are continuing to be made, in exploration programs to find new oil, in the development of producing properties, in our transportation, refining, and marketing branches, and in the petrochemical-manufacturing field. . ."

R. G. Follis, chairman of the board of Standard Oil Co. of California, in a statement to stockholders.

No Need to Apologize

". . . I make no claim that the petroleum industry is unique in its demands on ingenuity or enterprise. But, I don't think we need apologize for it as a dramatic symbol of our American system . . ."

Henderson Supplee, Jr., president of Atlantic Refining Co., in an address after accepting the Founder's Medal of Drexel Institute of Technology.

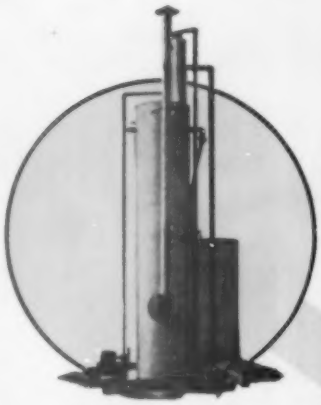
CALENDAR OF EVENTS

OCTOBER

26-28 Society of Automotive Engineers, national diesel engine meeting, Statler Hotel, Cleveland.
26-29 National Clay Minerals Conference, Rice Institute campus, Houston.
28 Canadian Petroleum Association, Saskatchewan division, annual meeting, Hotel Saskatchewan, Regina.
29 Natural Gasoline Association of America, southern regional meeting, Blackstone Hotel, Tyler, Tex.

NOVEMBER

1-3 Geological Society of America, annual meeting, Statler Hotel, Los Angeles.
3-5 Gulf Coast Association of Geological Societies, fourth annual meeting, Rice Hotel, Houston.
4 American Association of Oilwell Drilling Contractors, third annual South Louisiana safety clinic, New Iberia, La.
4-6 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.
4-5 Third Annual Instrumentation Con-



Dunham Tanks

New... Modern...

Our Minden, Louisiana, plant

Like a dream come true, engineers are finally getting their chance to manufacture the kind of tanks the petroleum industry has been wanting for years.

Dunham Tanks are made to modern, specifications, built with modern tools and machinery, designed by engineers who look to the future and are backed by years of tank knowledge and experience.

Here is the plant with an eye on the future of the petroleum industry. Here is where you will realize greater profits through greater service. Dunham Tanks is certainly a name worth remembering the next time you buy tanks.

Service.... Experience....

Here is the home of Dunham Tanks. The plant is equipped with the latest in tools, machinery and experienced personnel. Here's top-notch industrial ability forcing a brighter, fresher tank industry picture.

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ANDERSON-DUNHAM, INC. DUNHAM TANKS TANK DIVISION

DUNHAM TANKS

DIVISION OF ANDERSON-DUNHAM, INC., BATON ROUGE, LA.

DON'T DROP THAT FISH!

CATCH IT SAFELY WITH TRI-STATE'S NEW WASHOVER DRILL COLLAR SPEAR

Now . . . fully field-proved this NEW TOOL has 100% record of success on well after well under tough, difficult fishing conditions. No accidental discovery . . . Tri-State's NEW WASHOVER DRILL COLLAR SPEAR was developed in the field by fishing tool men . . . men who have known the need for a tool to overcome the hazard of dropping a heavy string of drill collars or drill pipe, stuck off the well bottom, while washing over the stuck section.

Easy and Safe to Operate, the tool is installed inside the washover pipe. It is positioned where it can be screwed into the fish and securely tightened before the rotary shoe reaches the stuck point. Turning the working string one-eighth turn to the left releases the tool from the control bushing. The washover string is then lowered and normal washover procedures followed. When the fish is washed free it will be securely and safely caught by the tool.

Four feet of travel in the tool permits the washover string to be raised for cleaning and circulation without disturbing the tool. It is a simple operation to release the slips on the tool to make a connection or to raise the string to greater heights. A special safety joint on the lower portion of the spear enables the operator to release the spear if the washover has been completed without freeing the fish. A quick connection on the safety joint makes it easy to reconnect to the safety joint either with the spear for further washing over, or for the purpose of backing off the freed portion of the fish.

Strongly constructed, the tool may be used in connection with any rotary jar and will withstand any pull that may be placed on 4½-inch drill pipe. A time-saving feature of this new tool is that, when the fish is recovered, instead of having to do the usual difficult stripping job, the spear may be released and lowered to the control bushing and the wash pipe laid down before handling the fish.

Tri-State's new washover drill collar spear has been successfully used by many outstanding operators in the Mid-Continent and Gulf Coast areas.

TRI-STATE OIL TOOL COMPANY, INC.

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BOSSIER BRANCH SHREVEPORT, LOUISIANA

I am interested in additional information:

- ☐ Send engineering data
- ☐ Have your representative call

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TITLE_____

COMPANY_____

ADDRESS_____

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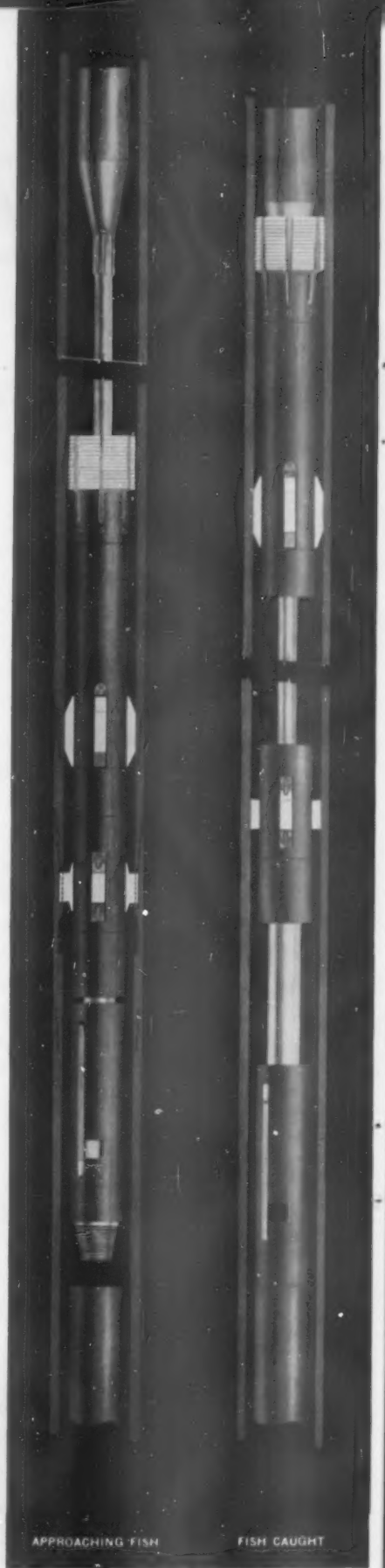
Box 598 Phone 1660 Magnolia, Arkansas	Box 5117 Phones 2-2711, 2-5561 Corpus Christi, Texas

TRI-STATE OIL TOOL CO. SHREVEPORT



APPROACHING FISH FISH CAUGHT

PATENT APPLIED FOR

ference, School of Engineering, Louisiana Tech, Ruston, La.

4-6 Air Pollution Control Association conference, Biltmore Hotel, Los Angeles.

5 Southern Gas Association, conference on field production of natural gas. Herring Hotel, Amarillo.

8-9 Gas Measurement Institute, Legion Hall, Liberal, Kans.

8-11 American Petroleum Institute, thirty fourth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

11-12 American Association of Petroleum Geologists, Pacific section annual meeting, Biltmore Hotel, Los Angeles.

17-18 North Texas Section, American Institute of Mining and Metallurgical Engineers, and Production Committee of the North Texas Oil and Gas Association, symposium on secondary recovery, Wichita Falls, Tex.

18-19 National Association of Corrosion Engineers, fourth annual conference of western region, Hotel Biltmore, Los Angeles.

18-19 Ninth Midwest Quality Control Conference, Society for Quality Control, Dallas.

18-19 Society of Exploration Geophysicists, eighth annual midwestern meeting, Adolphus Hotel, Dallas.

28-Dec. 3 American Society of Mechanical Engineers, Statler Hotel, New York.

DECEMBER

2-4 Interstate Oil Compact Commission winter meeting, Drake Hotel, Chicago

2-4 American Chemical Society, Southwest Regional meeting, Fort Worth, Tex.

3 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.

12-15 American Institute of Chemical Engineers, annual meeting, Statler Hotel, New York.

1955

JANUARY

17-18 Kansas Oil Men's Association, annual convention, Baker Hotel, Hutchinson, Kans.

26-28 Symposium on instrumentation for process industries, A. & M. College of Texas, College Station, Tex.

27-28 American Chemical Society, symposium on hydrocarbon chemistry, Rice Hotel, Houston.

FEBRUARY

14-16 Rocky Mountain section of A.A.P.G., annual regional convention, Billings, Mont.

16-18 National Association of Corrosion Engineers, sixth annual short course for pipeliners, Mayo Hotel, Tulsa.

25 National Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

MARCH

4 Southern Gas Association, transmission management conference, Shamrock Hotel, Houston.

7-11 National Association of Corrosion Engineers, Palmer House, Chicago.

24-25 American Gas Association, gas supply, transmission, and storage conference, Wm. Penn Hotel, Pittsburgh.

JUNE

16-18 Interstate Oil Compact Commission, Denver.

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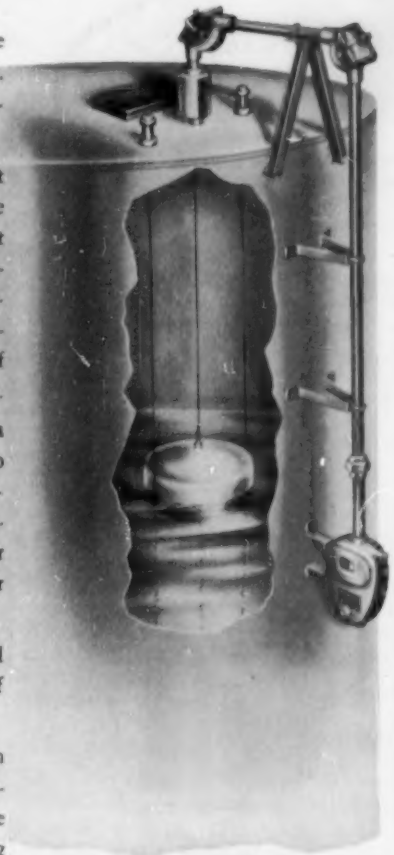

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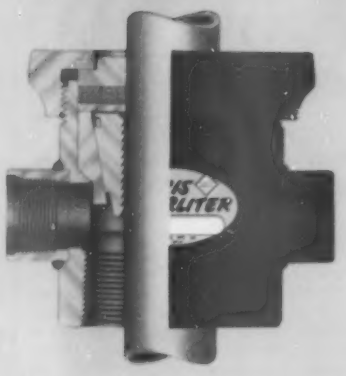

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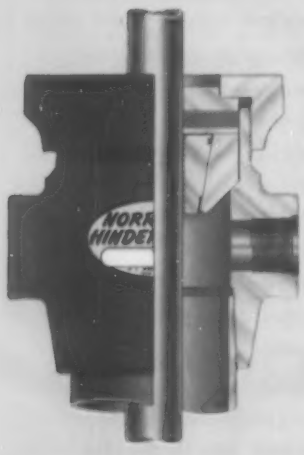

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THE OIL AND GAS
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TULSA, OKLAHOMA

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JOURNALLY Speaking

To Bury a Fish

OUR Pilgrim forefathers discovered that the Indians along the stern and rockbound coast on which they landed had a custom of burying a fish in each hill of corn, a practice which led, by a devious route, to the latest glamor girl of the oil and gas industry—commercial fertilizer.

Farther along in this issue is quite a bit about making ammonia fertilizer out of oil, so we won't go into the process here. It was a long jump from fish to oil, in fact it was a series of hops halfway around the world.

The first commercial fertilizer sold on a large scale was natural nitrate mined in Chile, and for many years Chile had a virtual monopoly on the world's supply of nitrogen for fertilizer, explosives, and chemical use. Then, early in this century, a Scandinavian process for "fixing" atmospheric nitrogen by electric arcs demonstrated that this valuable element could be extracted from the air.

The chemically minded Germans grabbed onto this idea and after a lot of highly secret experiments, they developed a much cheaper method of combining air and hydrogen to make ammonia from which other nitrogenous chemicals could be produced. It was this process, as much as anything else, that convinced the Kaiser that Germany could win World War I even though cut off from Chilean nitrate as a source of explosives.

He was almost right. The United States Government tried desperately to develop a fixed-nitrogen industry. It built a huge hydroelectric plant at Muscle Shoals, Ala., to use the arc process and then switched, in the middle of the war, to what was hoped to be a copy of the German process. But the Kaiser ducked out to Holland before Muscle Shoals got into operation, and for some 15 years after the armistice the idea of a government-operated nitrogen industry was a political football.

It's a good thing that the Government didn't go into the fertilizer business on a big scale, or it might have stifled progress by making it difficult for private enterprise to compete. As it was, America's chemists went to work and managed to make big inroads into Chile's hold on the nitrate market here. Up until about World War II most of our synthetic nitrate was a byproduct of steel mills and of chemical plants with surplus hydrogen.

Then it was discovered that hydrogen could be taken from natural gas and combined with nitrogen from the air to make ammonia and its relatives economically. This was the biggest source of nitrates for munitions during the second war.

The fertilizer-from-gas business has been going strong ever since, and now oil refineries are finding that their catalytic reformers produce a lot of hydrogen, so they are getting into the act, too. About 80 per cent of the nitrogenous fertilizer used in the United States now comes from oil or gas.

Today's farmer riding his tractor through his fields pulling a machine that buries nitrogen in liquid or powder form at the plant's roots is the spiritual descendant of the Indian who buried a fish in his corn hill. Only he gets better results with less work, thanks to the marvels of petrochemistry.

To Choke a Cow

SPEAKING of oil and agriculture, sometimes it works the other way. A major oil company has just lost a $3,000 damage suit to a farmer who claimed that a leaking pipeline in his pasture killed a couple of his cows and made the rest give milk that tasted like gasoline.

Now if the company had just turned that oil into fertilizer before it got on the pasture, the farmer would have paid the company, the cows would be fat and contented, and everybody would be happy. It's the processing that makes the difference.

—Henry D. Ralph.

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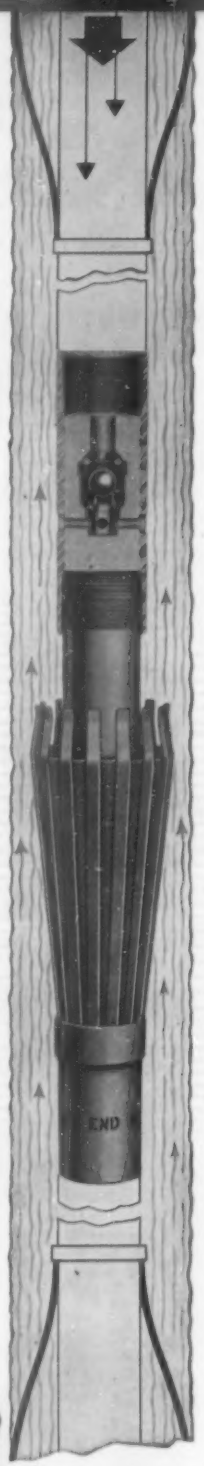

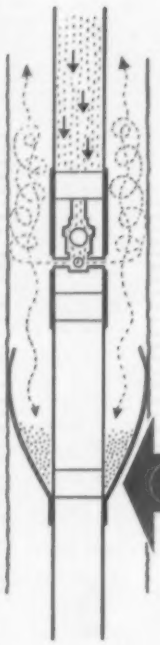

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The overlapping "petals" (each mounted on its individual spring steel rib) provide flexibility and freedom of expansion to pack-off around the circumference of large-diameter holes, or holes of irregular contours.

The offshore gamble is a bet on good times to come

MANY eyebrows are being raised in the oil industry at the high prices bid for offshore leases at the Government's first auction.

Bonuses up to $1,000 and $1,200 per acre were offered for the right to hunt for oil in untested territory 30 or 40 miles out in the stormy Gulf of Mexico in open water 40 to 60 ft. deep.

That's mighty expensive wildcat acreage. But it's only a start—only a fraction of the additional millions that must be put into man-made islands, marine equipment, communications, and protection against the sea, to say nothing of the actual drilling and producing costs.

By the law of averages, many of these wildcats will be dry. Others will find marginal production that may not even pay interest on the investment. The only hope for a profit is discovery of some very large, concentrated reserves. But any way you figure it, this offshore oil is going to be high-cost oil.

ARE THESE HIGH BIDDERS NUTS? From the short-time view it looks a bit screwy to stake millions on a long-shot gamble for high-cost new oil at a time when we have an excess supply of oil, unused producing capacity, heavy proration, low-priced crude begging a market, and foreign oil threatening to come here in increasing volume.

But these oil companies are looking way down the road. Obviously they have faith not only in the chances of finding big reserves in the gulf but also in the prospects for selling it profitably in spite of its expected high cost.

It will take a number of years to develop really big production in the gulf. By that time, these operators believe, domestic demand for petroleum will have increased to the point where great new supplies will be needed. Many presently producing fields will then be on the decline. In this view, the current oversupply is a temporary thing.

Note also that the majority of the offshore bidders are themselves importers or affiliated with companies with big foreign holdings. This suggests that they have not turned their backs on this country, nor do they anticipate that foreign oil will eliminate the need for increased domestic production.

AND THE HIGH COST anticipated for offshore oil presages a general increase in the price of crude throughout the country. Payout estimates of at least some of the operators are based on crude prices somewhat above current postings along the Gulf Coast.

All in all, the eagerness of these companies to pay high prices for the privilege of spending many times more in hope of finding new oil fields indicates a sound belief in the future of the crude-oil business in this country and a belief that the present long position of crude supply will be reversed a few years hence.

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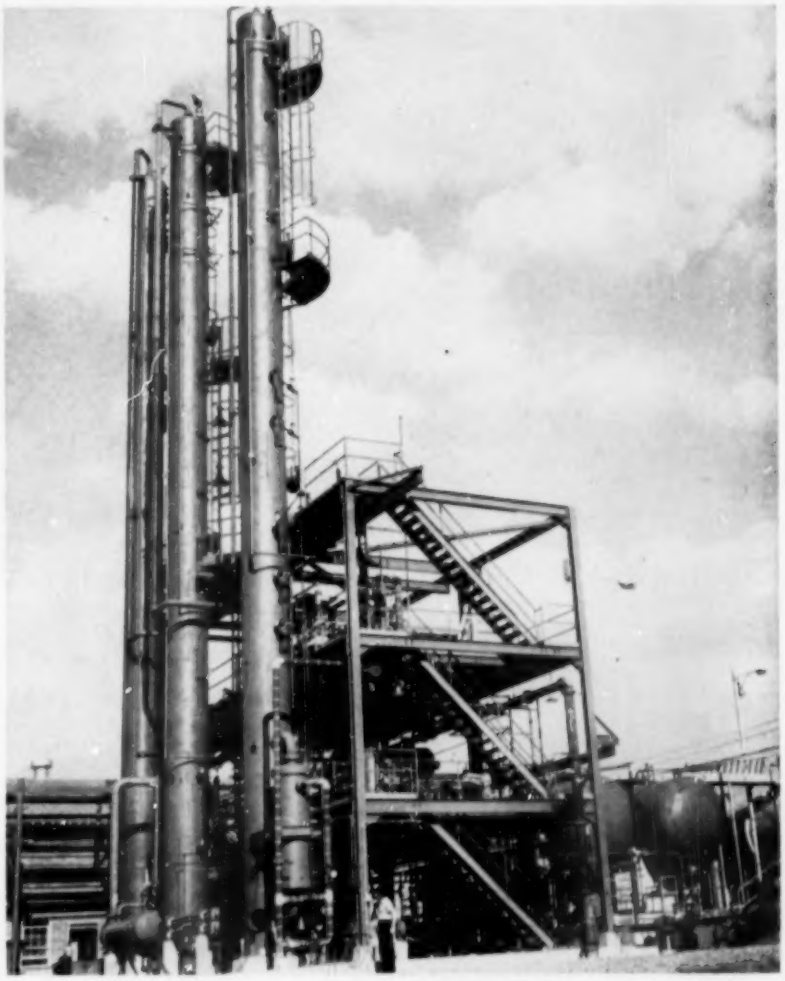
THIS WEEK... ...IN THE NEWS

OPTIMISTIC OUTLOOK of the expanding petrochemical industry is manifest in such new plants as the one shown here, which recently was completed by Allied Chemical & Dye Corp.'s Solvay Process Division at Moundsville, W. Va. The plant added significantly to the domestic capacity for chloromethanes, which illustrates a trend promoted by the entry of petroleum-derived products in the chemical field. For details about the outlook for petrochemistry turn the page.



INTERNATIONAL—Venezuela, in a surprise move, takes bids for first oil concessions to be granted there in nearly 10 years. . . . Friday was deadline. . . . No public announcement was made, but bidding was expected to be high. . . . ¶Number of rotary rigs operating in non-Communist world outside the U. S. and Canada shows increase in past 6 months. . . . Survey shows 687 rigs making hole. . . . ¶Peru permits increase in prices of petroleum products sold for domestic consumption. . . . Controls are relaxed as Peru is threatened with necessity of importing oil. . . . ¶Drilling fails to yield expected oil oasis in Peruvian desert. . . .

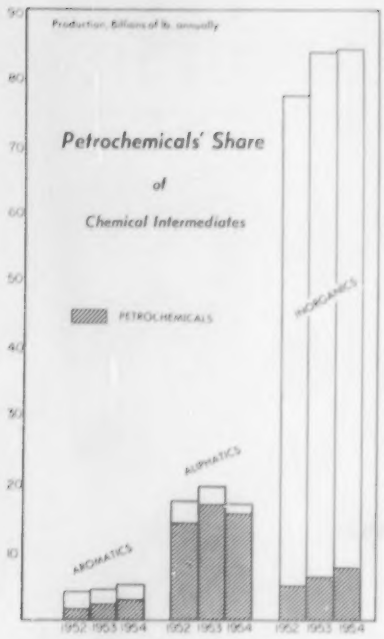
PIPELINE—Williams Brothers Co. crews complete laying and welding of 620-mile, 8-in. military products line in Alaska in one season. . . . U. S. Engineers hail job as monumental feat of construction. . . . ¶Panhandle Eastern files protest with FPC charging that American Natural Gas is pursuing "monopolistic" program with plans for American Louisiana line. . . . Panhandle asks FPC to stay certificate granted for line. . . . ¶North Dakota Natural files new application, adding 12 more towns to original plans for 474-mile pipeline. . . . New application assures company a November 16 hearing on revised plan for Tioga-Fargo-Grand Forks gas line. . . . ¶Gulf Interstate to begin moving gas through 845-mile, 30-in. main line from Louisiana to Ashland, Ky., by November 1. . . .

GOVERNMENT—Interior department lawyers check knotty legal problem involved in Kerr-McGee's Continental Shelf bid error to comptroller general. . . . Attorney for Kermac wants "clerical error" corrected, bids rejected outright, or tracts involved resubmitted for bidding at next sale. . . . ¶Supreme Court refuses to rehear Phillips case. . . ¶NPC committee defers action on recommendation for oil-shale research program until January 1955. . . . Committee was to study further a subcommittee report. . . . ¶Hugh A. Stewart becomes director of Oil and Gas Division dropping "acting" from title. . . .

IMPORTS—Reports to the Texas Railroad Commission indicate imports of crude and products for the next 4 months will average about 4.9 per cent more than for corresponding months last winter. . . . ¶Total imports in August were 7.1 per cent below January-July average, according to Census Bureau figures. . . . ¶The Texas Co. opposes legislative restrictions on crude imports.

PRODUCTION—Two Shell Dutch engineers outline for the A.I.M.E. their secondary-recovery experiments using miscible liquids for injection. . . . They say flood of miscible fluid is more efficient than water after breakthrough. . . . ¶Full-scale flooding operations through 53 injection wells of main injection system begins at SACROC. . . . Railroad Commission restores unit to statewide allowable status. . . .

EXPLORATION—Tide Water signs agreement with White Eagle Oil and Panhandle Oil for deep exploration program on White & Baker ranch in eastern Pecos County, Texas. . . . ¶Two deep tests scheduled in Texas Panhandle's Palo Duro basin. . . . ¶Humble has apparent new depth record for Louisiana—and second world's deepest producer—in Weeks Island field. . . . ¶Continental seeks U. S. Engineers' permit for permanent drilling platform 22½ miles off Grand Isle in Louisiana waters. . . .



Another Record Forecast In Petrochemical Output

This year's production of petrochem intermediates to be up approximately 1 billion pounds, Journal study shows

Modest gains in aromatics and inorganics are expected; slump in textiles and antifreeze depresses aliphatics

George Weber

THIS looks like another record year for petrochemicals, even though total chemical production will fall below 1953.

Natural gas and petroleum derivatives are expected to furnish a bigger percentage of the aliphatic, aromatic, and inorganic chemicals this year.

A study weighing current production trends with incomplete production figures for this year indicates the total output of petrochemical intermediates should reach nearly 27 billion pounds, up roughly 1 billion pounds from 1953. As outlined in the accompanying chart, aliphatics production, which accounts for 60 per cent of all petrochemicals, will fail to meet last year's record figure. Modest gains in both aromatics and inorganics should offset this loss, however, to chalk up a new petrochemical record for the year.

Aliphatics

Because of slumps in two large aliphatic consumption groups, this year is going to be a poor one for that class of organic chemicals.

In the textile industry, acetate-rayon has slumped badly. The output of cellulose acetate is expected to fall from 435 billion pounds last year to 340 this year. This drastic reduction which is a continuation of a decline which began in 1952 has combined with losses in other synthetic fibers to depress the output of such major tonnage intermediates as acetic anhydride, acetone, and ethanol.

Antifreeze lags . . . Another upset in a major petrochemical market has been marked by two mild winters which have badly depressed the antifreeze market. This has hit other large intermediates: methanol and the glycols. Even if the coming winter proves colder, no significant boost in 1954 output of these chemicals is probable.

The long-term trend in aliphatic chemicals and in the petrochemical fraction is unquestionably upward. The current set back, like that of 1952, was brought about by a slackening in demand for some of the mainstays of the aliphatics line which account for a large percentage of total production in that class.

Future bright . . . Many new aliphatic classes are now emerging with the probability that they will become major tonnage items in future years. Typical of these classes are the so-called "Oxo" chemicals which are growing in volume to meet rising plasticizer needs. Another class is the halogenated hydrocarbons which supply a wide field of finished products including weed-killers, insecticides, aerosols, synthetic fibers and resins.

The broad base of growing aliphatics is illustrated by the fact that 53 petrochemicals, mostly aliphatics, have reached tank-car production status since World War II. As some classes of synthetic fibers and rubbers give ground to others, major tonnages of intermediates may be affected temporarily, but the over-all trend is toward sound growth in the aliphatic group.

Year's total . . . The Journal survey indicates this year's production of all aliphatic intermediates will total roughly 17.5 billion pounds. Of this, approximately 16 billion pounds, or 90 per cent, will be derived wholly or in large part from petroleum and natural gas.

The estimate is based on the U. S. Tariff Commission's yearly figure for "miscellaneous chemicals, acyclic," with adjustments to compensate for chemicals not included in that survey, such as fermentation alcohols and pure hydrocarbon polymers. A further adjustment was made on basis of monthly production rates for a number of key intermediates, production outlook for the fourth quarter, and other major tonnage factors.

Aromatic Intermediates

Chemicals of the cyclic or aromatic classes still comprise a relatively small volume as compared with aliphatics. This group is growing, however, and has shown consistent gains each year

Petrochemicals: What Are They?

THE term "petrochemical" has acquired a widespread usage as defining a rather loose and disparate group of chemicals derived wholly or in large part from fractions of crude oil or natural gas.

Petrochemicals represent no clear-cut group of chemicals, and in many cases differ from other chemicals only in their origin.

Although exceptions creep into most compilations, petrochemicals are considered to be restricted to products which find further usage in chemical processing. This rules out the fuels and avgas toluenes, such as alkylates, and such petroleum and coal-tar constituents as asphalt and road tars.

In the Journal survey, as in many others, the category includes carbon black consumed in tire manufacture, sulfuric acid derived from sulfur compounds occurring in crude oil and natural gas, and nitrogen products derived from synthetic ammonia whose hydrogen is petroleum-derived.

The figures discussed in this study refer to intermediate chemicals. Finished products from petrochemical sources combine the materials of so many sources other than petroleum that they do not reflect the true output specifically from oil and natural gas.

Even the most meticulous estimate of petrochemical intermediates is likely to have some duplication since a portion of one intermediate often is consumed in synthesizing another intermediate.

Production figures for petrochemical intermediates for past years are based on the U. S. Tariff Commission's reports. For the current year, they are estimated from the output trends of crude chemicals which go into their manufacture.

without the more violent fluctuations suffered by aliphatics.

Again, the basis taken for past production is the tariff commission's tabulation of cyclic intermediates. These are derived primarily from four basic aromatic chemicals: benzene, toluene, xylenes, and napthalene. While a large volume of other basic "chemicals" in this class are reported, such as distillates and solvents, tars, light oils, etc., these products are generally consumed as such without further purification and without conversion to other finished chemicals. Hence, they are disregarded in assuming a factor with which to estimate current production.

General trend in output of the so-called "B-T-X" basics (benzene, toluene, xylene) continues upward this year, and the part played by petroleum refiners in their production is still growing. It is estimated that the oil industry's share in benzene production will rise from 23 per cent in 1953 to nearly 35 per cent this year.

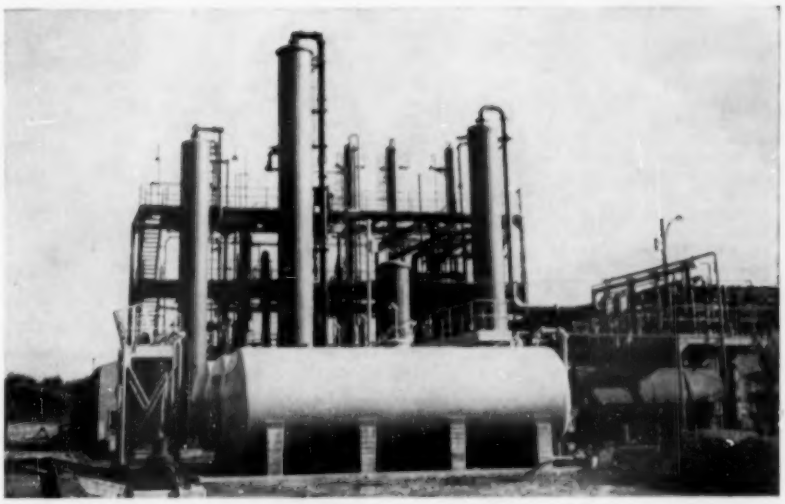
While toluene production will in all probability show a slight decline this year, the petroleum industry will still account for nearly 75 per cent of production. In xylenes, some tapering-off from first-half rates may be expected late this year, but the 1954 total will exceed last year's by about 15 to 20 per cent. Petroleum xylenes will account for 95 per cent of the total and this share is expected to grow with completion of new facilities.

Leveling off seen . . . In the long range, it appears that petroleum aromatics may level off during the next several years. The major construction program involving catalytic reformers and specialized extraction facilities has slackened and another "round" of refiners' investments in this class of processing equipment will probably await further increases in consumption.

The threat of coal hydrogenation to petroleum aromatics is not clear at present. While some operators believe that new techniques for producing large tonnages of aromatics from coal will push the relatively high-cost petroleum aromatics out of some markets in the future, others point out that coal hydrogenation produces fairly small yields of the basic aromatics and should not be a major factor.

As in aliphatics, the broad base of aromatics intermediates and the multiplicity of end uses point to a sustained growth curve. Not all consumption factors are on the increase, however. Synthetic rubbers, for example, are off sharply this year. This affects the demand for styrene, but other intermediates from benzene offset this trend.

Petroleum main source . . . It appears that all cyclic intermediates will show a continued rise for 1954, amounting to about 5.4 billion pounds, of which more than half will come from petroleum sources.



GROWING IMPORTANCE of petroleum-derived products in the chemical field is illustrated by this new petrochemical plant recently completed at Moundsville, W. Va., by Allied Chemical & Dye Corp.'s Solvay Process Division. It produces methyl chloride, methylene chloride, chloroform, and carbon tetrachloride.

This year should mark a milestone, being the first such period when petrochemical aromatics exceed those derived from coal coking and gas manufacture. The trend is notable since petroleum benzene was first produced in commercial volumes as recently as 1950. Capacity for extracting this essential basic from catalytic reformate now stands at over 100 million gallons per year in 11 domestic refineries, and other facilities are under construction.

Combined toluene and xylene capacity is approximately 350 million gallons per day. A considerably greater capacity exists for production of these basic aromatics in the nation's catalytic reformers, requiring only the installation of extraction facilities. It appears, however, that the incentive for boosting aromatics production from reformate is slackening, due both to a stabilizing aromatics market and a brisk octane race which requires high octane aromatics for motor-fuel blending.

Inorganics

The petroleum industry contributes the raw materials for three large tonnage products in the inorganic chemical category: carbon black, sulfuric acid and synthetic anhydrous ammonia. These three components might be classed as "borderline" petrochemicals. While they are not recognized as petrochemicals by some, they are included in most comprehensive surveys of that field. Approximately 8 billion pounds of inorganic chemicals produced this year will be derived from petroleum.

These inorganics comprise a very minor tonnage when compared with the output of heavy chemicals synthesized from sulfur, chlorine, phosphorus, sodium, etc. The fraction derived from petroleum sources is steadily increasing, although it may never amount to much in the total picture.

Carbon black production, reflecting declines in rubber and tire manufacture, should be off about 10 to 15 per cent from 1953. The trend toward furnace black at the expense of the older channel process continues, with furnace black accounting for roughly 72 per cent of current production compared with 65 per cent last year.

Minor factor . . . The industry's share of elemental sulfur production has risen again this year, but the rate of increase has slackened. The largest sulfur-from-hydrogen sulfide operations were installed 2 and 3 years ago and recent plants generally have been smaller installations. It is estimated that this year, roughly 7½ per cent of all sulfur produced by Frasch and all recovery methods will come from hydrogen sulfide in natural and refinery gases.

This share in sulfur production will remain a minor one, but for the long-range forecast, petroleum sulfur should show nominal growth. Domestic refiners are charging more sulfur compounds to stills with their crude each year. A recent survey illustrated the increasing prevalence of higher-sulfur crudes in world production.

Production of domestic crudes containing 1 per cent or more sulfur in-

UNITED STATES SYNTHETIC ANHYDROUS AMMONIA CAPACITY
(Tons per day)

Source—	Operating	Per cent total	Contracted	Est. total end 1955	Per cent total
Natural gas	7,360	81.4	1,532	8,892	76.9
No. plants	22			28	
Other petroleum	100	1.1	760	860	7.4
No. plants	1			3	
Total petroleum	7,460	82.5	2,312	9,752	84.3
No. plants	23			31	
Electrolytic and coal	1,604	17.5	215	1,819	15.7
No. plants	10			12	
All sources	9,064	100.0	2,527	11,571	100.0
No. plants	33			43	

creased from 731,000 bbl. per day in 1940 to 1,656,000 bbl. per day in 1953. Over the same period the increase in processing of foreign crudes has further augmented sour crude refining in this country. Nearly 65 per cent of Venezuelan production last year contained 1 per cent sulfur, and practically all Middle East production is sour.

The increasing amount of sulfur components handled in U. S. refineries will swell the sulfur output of plants maintaining extraction and conversion facilities. In addition, catalytic desulfurization processes which utilize low-cost reformer hydrogen are being regarded with high interest by U. S. refiners. As a result, the moderate trend toward increased recovery of elemental sulfur from petroleum sources should continue.

Ammonia unlimited . . . The one petrochemical which consistently chalks up records each year is synthetic anhydrous ammonia. This product outshines all others in its potential demand.

Of the intermediates and finished chemicals based on nitrogen over 70 per cent now go into agriculture fertilizers. This use alone shows a future demand which can be projected directly on the basis of population increase, according to market analysts in that field. Industrial uses also are on the increase.

Future demand for nitrogen is conservatively expected to double by 1966. This additional requirement must be met entirely from synthetic anhydrous ammonia which today provides 80 per cent of our nitrogen needs. This calls for doubling the nation's ammonia production during the next 10 years.

Trend continues . . . The projection of new ammonia capacity indicates a continuation of the rate of increase registered since 1948, when domestic ammonia plants totaled a little over 1 million tons per year. Present capacity and new facilities contracted for completion within the next 18 months are summarized in the table.

An important factor illustrated in this current construction is the sizable share of capacity based on natural gas and other petroleum sources for hydrogen. Ammonia capacity based on natural gas was negligible before World War II. Today, over 80 per cent of capacity is based on natural gas reforming.

New source . . . Now a new hydrogen source for ammonia has entered the production picture. A 100-ton per day plant was completed last year, utilizing byproduct hydrogen produced in the catalytic reforming process. Contracts have been signed this year for four additional plants to be based solely or in part on this type of hydrogen. In addition, two plants on the drawing boards may be based on hydrogen produced from the partial oxidation of bunker C fuel oil.

While it is probable that several other large ammonia installations will be built to utilize byproduct reformer hydrogen, a relatively small fraction of this hydrogen is likely to be so employed. A large capacity installation is necessary for economic reasons, and most of the hydrogen is produced in small volumes at widely separated points. New ammonia production is locating nearer the agricultural consuming areas of the Middle West, whereas most of the reformer hydrogen available in large quantity is at seaboard plants. Hence, natural gas is expected to continue to provide the bulk of the feed stock for the next decade or two.

General Petrochemical Trends

Extended forecasts of petrochemical production sometimes indicate an unlimited future, with regard to both pounds and dollars. While crude oil and natural gas will continue to contribue a greater share of basic materials to organic chemical manufacture, it is doubtful that petrochemicals will comprise half of total chemical production for many years to come. The heavy tonnage inorganics will also increase in demand, and some analysts consider it unlikely that petrochemicals, even with the most optimistic growth, will overtake the heavy inorganics in actual tonnage production.

Although it still lags far behind tonnage-wise, the petrochemical industry is beginning to resemble the heavy inorganic chemical industry in comprising large volume production at a low profit margin. This trend reflects the influence of the oil industry which has entered the field and in some cases has overbuilt.

Some organics such as ethanol, ethylene oxide, and the glycols have undergone moderate to severe price reductions. Further reductions are likely in a great many other mass-produced intermediates, both organic and inorganic. The company contemplating entering the petrochemical field had better make certain that it can operate economically at reduced prices for product, particularly if it plans to produce a large-volume chemical.

New Plant Proposed

Three companies may build ammonia plant in Florida

PENSACOLA, Fla.—A 4-year research program conducted by three companies has resulted in a proposal to organize a new firm, Gulf Chemical Co., and build a $23 million ammonia plant here.

The proposed plant, which will use natural gas as a feed stock, was the result of work done by United Gas Corp., Shreveport; Electric Bond & Share, New York City; and National Research Corp., Cambridge, Mass. The first two firms each owned 40 per cent of the research and the latter the remaining 20 per cent.

Initial capacity of the plant has been set for 200 tons daily of anhydrous ammonia and 40 tons daily of polyvinyl chloride. Gulf officials have indicated the ammonia plant will be constructed as soon as practicable, with other additions coming later. Company officials hope to have the ammonia plant on stream by January 1956.

Details of the proposed Florida works were revealed in an application filed by United Gas with the Securities and Exchange Commission for permission to acquire an interest in newly formed company. The request also indicated additional plants may be constructed by Gulf Chemical.

Gulf Chemical—the company has no connection with Gulf Oil Corp.—will manufacture ammonia, ammonium nitrate, and other nitrogenous materials for industrial and agricultural uses.

United Gas Pipe Line Co., a wholly owned subsidiary of United Gas, will sell the gas to Gulf for use as a feed stock.

United and Electric Bond will finance the plant on an even share basis, and both will offer National an option to buy 10 per cent of their stock. If National should exercise this option, it would acquire 20 per cent of the plant with the other two holding 40 per cent apiece.

New Water-Flooding Twist

Two men from Dutch-Shell's Amsterdam laboratories tell San Antonio meeting results of miscible liquids tests

Kenneth B. Barnes

SAN ANTONIO.—Two Dutchmen, J. Offeringa and C. van der Poel, came to the annual Petroleum Section of the American Institute of Mining and Metallurgical Engineers meeting held here last week from the Koninklijke/Shell-Laboratorium, Amsterdam, The Netherlands, to outline experiments which may lead to a new method of secondary recovery of oil, particularly heavy crude.

Title of this paper from the Royal Dutch-Shell Laboratories was "Displacement of Oil from Porous Media by Miscible Liquids."

When an oil property is flooded by water injection the process is called displacement of oil by an immiscible liquid (the water). If the oil sand is flooded by butane, gasoline, kerosine, or the like, such injection liquid will of course go into solution with the crude oil. This is "displacement by miscible liquids."

A number of petroleum research laboratories in the United States are doing work on this subject, including field tests, so the San Antonio test disclosures were particularly interesting and timely.

Experiments . . . The recovery efficiency by water-flood of oils of viscosities exceeding 50 cp. is low. As interest in production of these highly viscous oils is growing at the moment, the Shell investigators considered it worthwhile to gain basic information on the feasibility of first flooding such oils with a low viscous miscible liquid (solvent) and subsequently producing the latter in a conventional way, i.e., by water flooding. The method has the obvious drawbacks that actual production is delayed until waterflooding has begun and that it requires the investment of a more valuable product to produce a less valuable one. On the other hand, it may be expected that the displacement of one liquid by another is more efficient when the two liquids are miscible than when they are immiscible.

Data were obtained on the effect of the viscosity ratio oil-solvent on the efficiency of the displacement process, the viscosity ratio varying from 1.5 to 5,000.

Breakthrough recoveries obtained when flooding with kerosine as a solvent, it was found, are equal to those obtained in water flooding at the same viscosity ratio, indicating that viscous fingering is decisive.

After breakthrough, however, flooding with a miscible liquid becomes much more efficient than a water flood, and this is more pronounced as the viscosity ratio oil-solvent is higher.

Recirculation . . . Although high oil recoveries are obtained and most of the solvent in the sand can be recovered by a subsequent waterdrive, a straight flood with miscible liquids does not appear economically attractive due to the quantities of solvent required.

Therefore, a recirculation process was developed by the Shell research experts. By means of this recirculation process, the amount of solvent required can be drastically reduced.

The recirculation process involves the following procedure: After breakthrough of the solvent part of the outflow is reinjected, the remaining part is withdrawn from the circuit (bleeding) and replaced by the same amount of pure kerosine. This recycling process is continued until the viscosity of the resulting mixture in the sand has been lowered sufficiently for successful application of a water flood.

The economy of the recirculation procedure is illustrated by the following data:

. . . Without recirculation 650 per cent pore volume of kerosine had to be used to reach an oil recovery of 77 per cent pore volume, while with recirculation a recovery of 81 per cent with only 48 per cent pore volume of kerosine could be obtained.

. . . The amount of kerosine lost was practically the same in both cases, 11 per cent and 10 per cent, respectively. Thus, by applying the procedure in which after breakthrough the outflowing immiscible liquid is recirculated for some time, the amount of kerosine required can be drastically reduced without decreasing the oil recoveries.

Sand Control Outlined

New "squeeze-pack" successful in 85 per cent of wells; chemical treatment removes water blocks, A.I.M.E. told

Edwin McGhee

SAN ANTONIO.—A new method of sand control and a new type chemical treatment will soon afford better control of incompetent sands and removal of water blocks. The methods were described here to the petroleum branch meeting of the A.I.M.E.

H. B. Ritch of Dowell Incorporated, New Orleans, said successful field trials of a new "squeeze-pack," utilizing a large-grained sand carried in a gel, have been carried out on the Gulf Coast. A liner is used to contain the packing sand, and the packing sand in turn contains the incompetent sand of the producing formation in place. The method is similar, but not identical, to the "fracture-pack" method used by Cities Service Oil Co. *(The Oil and Gas Journal, October 18, page 101.)*

According to Ritch, the "squeeze-pack" has been successful in 85 per cent of the wells in which it has been tried. Advantages claimed for this method are that it forces little extraneous fluid into the formation and it requires less rig and service time.

Chemical treatment successful . . . A. W. Garst of Stanolind Oil & Gas Co., Tulsa, said his company is realizing about 1,200 bbl. of oil per day as a result of using a new chemical treatment to remove water blocks in some of its wells. So far the treatment has been utilized in about 90 wells, and 30 are considered entirely successful. Payout time for the treatment on those 30 wells was about 6 days.

Fracturing has spotlight . . . At least five of the papers presented at the A.I.M.E. meeting dealt directly with hydraulic fracturing; several others mentioned it prominently with respect to specific fields. G. E. Roark and J. D. Lindner of the James A. Lewis Engineering Co., Dallas, cited a field case of a water flood in which fracturing has been applied extensively. This discussion is one of the first to definitely show that fracturing need not preclude a successful flood. In fact, they con-

cluded that water injectivity has apparently been improved in this well.

Paul B. Crawford and B. L. Landrum of the Texas Petroleum Research Committee, said one large fracture in a thin sand is probably better than several small fractures. Peter Dehlinger of Texas A. & M., W. H. Browne of Battelle Memorial Institute, and C. O. Bundrant of The Western Co. told the group that there is definitely an optimum concentration of sand per gallon of fracture oil, but it is difficult to arrive at a correct figure for field use.

West Texas fracturing work was described by J. M. Moore, D. E. Ramsey, and R. E. Hurst of Dowell Incorporated, Midland. These authors said satisfactory results have been obtained from fracturing in every producing formation in the Permian basin. In a specific area, the Spraberry Trend, good results from large volume fracture treatments were reported by T. P. Brooks, P. C. O'Quinn, and W. E. Life of Southern Production Co., Inc.

Oil's Future Predicted

A.I.M.E. speakers say oil will begin to lose ground to other energy sources after reaching its zenith in 1970

Kenneth B. Barnes

SAN ANTONIO.—Looking 100 years into the future indicates petroleum will lose ground in its fight with other energy sources, particularly after 1970.

This was the prediction made here last week at the A.I.M.E. Petroleum Section meeting by James Terry Duce and A. H. Chapman, both of Arabian American Oil Co., New York. They based their forecast on figures taken from Palmer Putnam's report, "Energy for the Future," a wide-scope study made for the Atomic Energy Commission.

The Putnam report surveyed total use of energy for the next 100 years. The Aramco men said it indicates gas and oil will hit a maximum usage of 27 per cent of total energy in about 1970, then start a decline that will hit 10 per cent by 2050.

Other predictions made were:

. . . World population growth rate will double by the year 2050.

. . . A 3 per cent annual increase will occur in per capita demand for energy.

. . . A large-sized energy unit can be used, called the "Quantum." The "Quantum" consists of one times ten to the eighteenth power BTU's, and is the equivalent of 38 billion tons of bituminous coal, or 168 billion barrels of oil.

Duce displayed a chart for annual energy consumption for the period 1950-2050; the total energy usage for the 100-year period being 80 Quanta and running at the rate of 2.6 Quanta per annum by 2050.

On a second chart, Duce displayed other data from the Putnam report which indicated that the use of nuclear fuel would begin to carry a measurable quantity of the total energy requirement by 1970, with oil and gas reaching its maximum percentage useage.

Coal usage will be 15 per cent in 1970, and nuclear energy will increase to 65 per cent. Duce pointed out the 27 per cent for oil and gas in 1970 represents a far smaller quantity than the 10 per cent of the predicted requirements for 2050.

What for oil and gas? . . . Duce equated the Putnam data into annual oil-gas production requirements to the year 2050. In the year 2050 the requirements of the world would be 44 billion barrels per year, or 120 million barrels per day of oil-gas production equivalent.

To show the oil-gas supply picture to meet the preceding "demand" estimates, Duce presented the Putnam report figures for total hydrocarbon resources, as follows:

	Equivalent (billions bbl.)
Crude oil (estimated to be discovered)	730
Gas (34 per cent of undiscovered oil)	250
Tar sands	300
Shale oil	200
Total	1480

Duce pointed out that the world oil and gas reserve of 188 billion barrels (as of January 1, 1954) would carry the total energy supply to 1980, at which time there would then be 1,292 billion barrels (1,480—188) of possible hydrocarbon reserves existing. When these reserves are superimposed on the Putnam future demand schedule, they indicate the 1,292 billion barrels future expectancy would be completely used up in the 2041. In other words, 2041—if the Putnam calculations are correct—is the year in which all future discoverable and recoverable hydrocarbons will be used up.

A.I.M.E. Officers Elected

SAN ANTONIO.—Robert B. Gilmore of DeGolyer & MacNaughton, Dallas, was elected chairman of the Petroleum Section of American Institute of Mining and Metallurgical Engineers at the group's largest annual meeting here last week. More than 1,700 members were present.

Other officers elected for 1955 are: Phil J. Lehnhard, East Texas Engineering Association, Kilgore, vice chairman; and G. L. Yates, Amstutz & Yates, Inc., Wichita, vice chairman.

Convention Delayed

Union merger postponed; new strike policy foreseen

DENVER.—The Oil Workers International Union has postponed its regular convention, originally scheduled to be held in Cleveland November 15.

New date for the convention will be set by the union's executive council at a meeting November 8.

Postponement of the international meeting was announced by O.W.I.U. President O. A. Knight after the United Gas, Coke and Chemical Workers Union canceled plans for a joint meeting with O.W.I.U. to finalize merger of the two C.I.O. groups into one big union.

A spokesman for the chemical workers announced its merger meeting had been postponed because of the lack of funds to finance the meeting and the shortage of time for acquainting locals with the merger plan. The chemical workers approved the merger at their recent convention in St. Louis *(The Oil and Gas Journal, September 20, page 137).*

Under an agreement between officials of the two unions, the O.W.I.U. will set a new convention date in February, March, or April. Oil workers will vote on the merger plan at that time. Assuming they approve it, a joint convention will be held to put the merger in effect.

Strike policy . . . In the meantime, O.W.I.U. chieftains are expected to map a new campaign for wage boosts.

The union's policy committee will meet November 11 to review labor-management negotiations and to consider possible withdrawal of the "no-strike" pledge made last spring. Knight recently indicated the union might change its negotiating tactics if it were not more successful in efforts to get a 5 per cent wage increase or its equivalent.

On another labor front, locals of the Central States Petroleum Union have agreed not to sign separate wage agreements with Standard Oil Co. (Ind.) unless a general settlement is approved by the union's board of directors.

Products Storage Up

NPC committee says clean products storage will show gain of 16 per cent by end of 1954; crude and residual drop

WASHINGTON. — Storage in the United States for clean products—gasoline, kerosine, and distillate fuels—has increased almost 10 per cent in the past 2 years and is expected to jump another 6 per cent by the end of 1954.

The National Petroleum Council's committee on petroleum storage released the results of its latest survey last week. The figures show a gain for clean products storage, but decreases in the storage capacity devoted to both crude and residual oils since the last survey in 1952.

The committee's report is based on replies to 350 questionnaires distributed to refiners and other holders of crude and product inventories. The crude section of the report represents 96.4 per cent of crude stocks in storage or transit; the clean products section is about 97 per cent; and the residual portion of the report represents 96.5 per cent of the inventories reported to the Bureau of Mines as or March 31.

Crude . . . Total capacity for crude storage in aboveground tanks was 425 million barrels on March 31, a decline of some 4½ million barrels from the 1952 survey figure. The 1954 figure includes almost 10 million barrels of reservoir storage in California. The West Coast's reservoir storage has declined about 4 million barrels since the 1952 survey.

The total crude in tanks and all other facilities, including tankers, pipelines, and others, amounted to 244 million barrels, with 195 million barrels in tanks alone. This would indicate the above ground storage for crude was 46.7 per cent full on March 31.

The NPC committee further broke down this crude total to show that 19.2 per cent, or about 49 million barrels, is required as main trunk and tank farm pipeline fill and as fill for tankers, barges, tank cars and trucks hauling crude. Another 76 million barrels is required to assure continuous operation of pipelines and 41 million barrels is needed for continuous processing and the handling and blending of the many grades of crude produced and processed in refineries.

The combined total of unavailable stocks amounted to 68 per cent of all crude in storage on March 31.

Clean products . . . Total storage capacity assigned to gasoline, kerosine, and distillates amounted to 467 million barrels and the storage contained 231 million barrels, or about 46.6 per cent of capacity, March 31. Included in this figure was 92 million barrels unavailable for shipment. This 36.5 per cent classed as unavailable includes 12.7 million barrels for line fill, 7.2 million barrels in transit by tanker, barge, tank car, and truck, and the balance in tank bottoms, refinery lines, operating equipment, and in pipeline operating requirements.

The committee estimated that the 467 million barrels of clean products storage capacity reported March 31 will increase to 496 million barrels by December 31.

The clean products capacity figure as of March 31 represents a gain of 9.8 per cent over the 425.5 million barrels listed in the NPC survey for 1952. The estimate for the end of 1954 indicates a gain of 16.6 per cent over the 1952 figure.

If the committee's estimate for December 31 is correct, it will represent an increase 175 million barrels of clean products storage capacity more than was found in the first NPC survey in 1948. As might be expected, most of this increase is shown in Districts I and II, the large demand areas.

Clean products storage has gained steadily with each survey. In contrast, storage devoted to residual fuels has dropped just as steadily since 1948. The same has been true of crude storage since 1950.

Residual fuel . . . The total residual storage capacity was 99 million barrels, 32 million of which was California reservoir storage. As of March 31 this storage contained 42 million barrels, or 42.6 per cent of capacity.

The committee said about 14.4 million barrels of this total is classed as unavailable for shipment because it must be retained to insure functioning of residual operating facilities.

This total is expected to increase to 106 million barrels, including 36 million barrels of California reservoir storage, by December 31.

Here's What Storage Surveys Since 1948 Have Revealed . . .

(Figures in thousands of barrels)

	Crude oil (Includes all crude categories except producers' storage)				Clean products (Gasoline, kerosine and distillate fuels)				Residual fuel (Residual fuel oils only)			
District—	1948	1950	1952	1954	1948	1950	1952	1954	1948	1950	1952	1954
East Coast	21,587	23,194	24,491	26,799	74,364	85,001	120,179	136,024	14,575	17,602	20,471	17,765
Appalachian:												
District 1	5,277	7,002	5,999	5,703	5,060	5,336	8,908	10,637	455	378	933	1,357
District 2	3,121	2,628	1,955	1,834	2,148	3,971	5,471	6,265	383	372	635	685
Ind., Ill., Ky.	37,356	44,322	46,045	44,200	60,275	69,118	85,114	98,330	8,814	8,611	9,536	9,431
Okla., Kans., Mo.	80,142	75,683	69,625	71,588	24,501	28,526	38,474	44,279	4,034	3,831	3,267	2,805
Texas Inland	82,393	82,344	80,541	84,522	7,387	8,604	12,253	13,105	1,705	1,969	1,868	1,731
Texas Gulf	79,787	83,922	83,526	76,314	54,285	56,797	61,458	54,426	10,715	10,317	11,675	10,136
Louisiana Gulf	16,196	15,937	16,012	18,957	16,673	17,811	20,574	23,227	3,726	3,457	3,208	2,467
North La.-Ark.	10,581	11,288	9,620	6,682	5,685	5,005	8,127	8,767	431	308	340	258
New Mexico	2,167	2,604	2,764	2,950	197	333	308	550	62	99	95	76
Other Rocky Mountain	18,525	18,482	18,448	18,538	7,669	11,036	11,373	14,290	1,888	1,942	2,057	1,836
Total east of California	357,132	367,406	359,026	358,087	259,244	291,538	372,239	409,900	46,788	48,886	54,085	48,547
California	*59,595	*64,912	*70,325	*66,774	60,515	56,526	53,221	57,104	*76,592	*57,172	*49,522	*50,348
Total U. S.	416,727	432,318	429,351	424,861	319,759	348,064	425,460	467,004	123,380	106,058	103,607	98,895
*Includes reservoir storage	2,525	11,733	13,912	9,945					41,574	34,751	31,447	31,938

Note: The 1952 relationship with prior years is somewhat overstated in clean products and to a lesser extent in residual fuel because of the broadened definition of a bulk terminal which became effective January 1, 1951. Also 1954 is somewhat understated in comparison with 1952 because of the exclusion in 1954 of the storage capacity assigned to jet fuel, the component parts of which in 1952 were being included in the over-all inventories of each clean product.

Pipe Loading in Arctic temperatures and deep snow is cold going. Cats and snowplows moved ahead of the first pipe to clear the 50-ft. right-of-way across mountains, lakes, streams, forests, and through swamps . . .

Stringing Pipe meant crashing through scrub timber and traveling the muskeg-covered icy soil. Cats helped trucks through on this access road to the right-of-way southeast of Fairbanks to where . . .

Pipelaying Crews sloughed through the boggy mud created by the sunshine on exposed permafrost. In areas like this the ditch could be dug and pipe strung in a conventional manner. At other sections of the line . . .

Special Crews welded the pipe at river and stream crossings that were left behind by regular spreads working rapidly across the rugged terrain to complete the job in one season of work.

Pipeline Crews Tame Alaskan Wilds

HAINES.—A welder broke the final arc on his electrode here last week, less than 6 months after pipeline crews started laying 620 miles of 8-in. products line to link this southeastern Alaska port with Fairbanks.

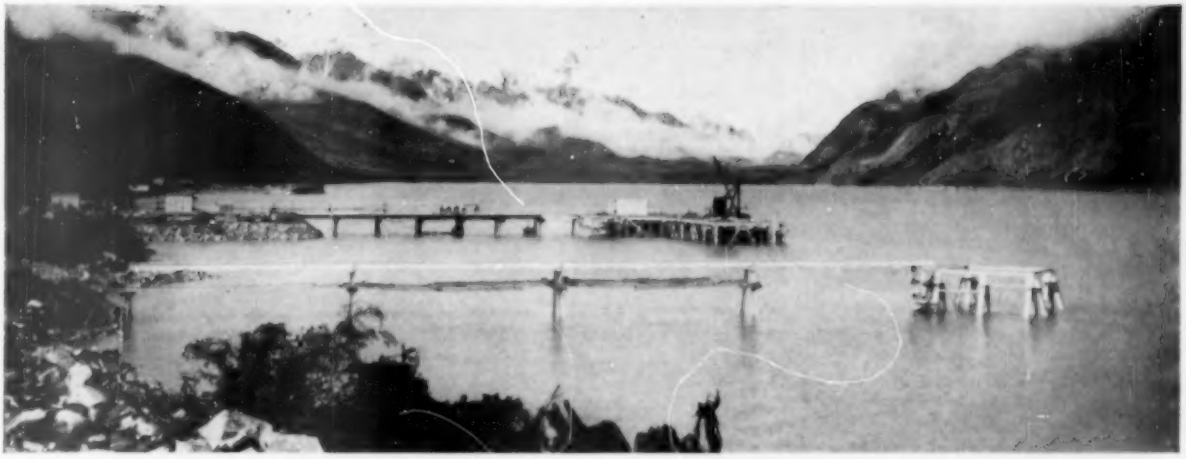
The final weld completed the most spectacular part of a $29 million project to supply United States military installations in Alaska with all types of fuels. It was a battle against the seasons, vicious Arctic mosquitoes, "no-see-ums" whose bite is severe enough to swell exposed portions of the body to twice normal size, and pipe that refused to stay buried.

Col. Carl Y. Farrell, Alaska District Engineer for the U. S. Army Corps of Engineers, called completion of the line "a feat which will go down in history as a memorial to the ingenuity and daring" of the construction industry.

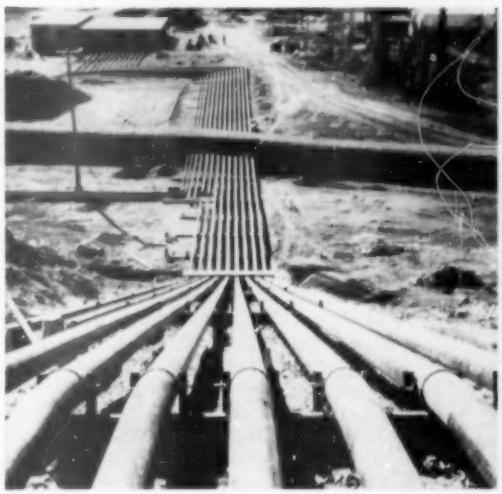
Scheduled for completion in September 1955, the project includes a dock and terminal at Haines, a terminal at Fairbanks, five pump stations, POL storage, housing and other related facilities. It was undertaken by a joint venture composed of Williams Brothers Co., Tulsa; McLaughlin, Inc., Great Falls, Mont.; and Marwell Construction Co., Vancouver, B. C. The Tulsa firm is sponsor of the venture and did the actual pipeline construction. The Marwell company will build the pump stations.

Clearing operations for the 620-mile line started last year in the middle of the severe northern winter. Big cats cut a 50-ft. right-of-way over the frozen tundra in sub-zero temperatures across Alaska and the Canadian Yukon to clear the way for pipe-stringing crews in the spring. The first joint was welded at the line's northern end of the outskirts of Fairbanks April 19. A few days later another spread started southward on the Canadian side of the Alaska-Yukon border, 300 miles southeast of Fairbanks. The Alaskan spread reached the tie-in point at the Canadian border September 19 and then jumped the 285-mile Canadian portion of the line to start work at the Alaska-Canada boundary 40 miles north of Haines.

The Canadian spread worked along



Haines Dock Takes Shape here as crews of the Marwell Construction Co. drive piles into Lutak Inlet for docking facilities at the southern terminus of the 629-mile products line to serve Alaskan military instal'ations.



Manifold Lines at the Tok Junction station of the line lead to the transfer building where products will be diverted from the line to storage and back again.

Permanently Frozen Soil lies just a few inches under the natural muskeg insulation in much of the area crossed by the line. Once the muskeg is scraped away, the subsurface melts and becomes a quagmire to bog down vehicles and generally hamper all operations.

the general route of the Alaska highway to Haines Junction, 100 miles north of Whitehorse, and then moved down the route of the Haines highway to the border.

Pipeline construction in Alaska and the Canadian Yukon is relatively new. There was a precedent in the Canol pipeline built during World War II, but Williams Brothers learned about Arctic construction the hard way.

The Arctic muskeg forms a natural insulation for a tremendous ice field which is the permanently frozen earth of much of the area crossed by the line. When this natural insulation is scraped away or churned up by heavy equipment exposing the "subsoil" to the sun, it soon becomes a swamp. Oldtimers in Arctic construction said this permafrost couldn't be ditched. At times it appeared they might be right, but Williams Brothers fabricated its own ditching machine of a special design. It dug the trenches for burying pipe through 100 miles of frozen soil.

To do the job, crews reversed the normal practice of ditching, stringing, welding and then covering pipe. They soon found if they ditched first, they didn't have a ditch by the time they were ready to put their line in the ground and cover it. Once exposed to the air, the subsurface mixture of frozen mud and water literally sloughed off the ditch that had been cut into it.

The pipe was strung, welded and then the ditching machine went to work so sections of the line could be covered before the ditch could melt away.

This unusual Alaskan "soil" gave the crews trouble after they had successfully completed the "reverse" procedure. As the permafrost froze again from the bottom of the ditch, it shoved the buoyant pipe upward to the surface.

Inspecting portions of its completed line, Williams Brothers found entire sections of pipe pushed to the surface, still topped by 24-in. of covering. This was remedied by reburying the pipe and counteracting its buoyancy with 300-lb. blocks of concrete about every 40 ft. in the most troublesome sections.

The final link in the line will be completed next spring after a highway bridge is completed to support the line's river crossing.

When it is placed in operation next year, the Haines terminal of the line will be fed by barges reaching Alaska by a protected water route from northwestern United States. This scenic Inside Passage is a continuous passage of inlets and waterways through the long chain of islands that dot the western coastal waters of Canada and southeastern Alaska. *(See detailed engineering article in November 1 issue.)*

Bid "Error" Studied

Comptroller General to decide if Kerr-McGee "clerical error" can be corrected; Shelf leasing awaits decision

WASHINGTON.—A "clerical error" which has placed $14,664,000 of Kerr-McGee Oil Industries, Inc.'s money in jeopardy, may hold up the final sale of government tracts on the Continental Shelf off Louisiana.

The Comptroller General has been asked by Interior Department attorneys to decide whether or not the "error" can be legally corrected. Secretary Douglas McKay told the National Petroleum Council last week he did not know what the decision will be or how soon it will be reached.

Kerr-McGee offered the Government more than $14½ million on 12 tracts listed for the sale, but the pioneer offshore drilling company's bids were made on block numbers listed on government maps and not on the tract numbers assigned for the sale. Kermac learned the difference much to its dismay.

The company "won" seven leases on which no one else bid, two of them for $3,766,000 and $2,166,000. On another, Kermac bid $4,166,000 for a lease on which the next highest of three other bids was only $513,000.

Officials of the firm, owned principally by Sen. Robert S. Kerr of Oklahoma, immediately made an effort to correct their error. They asked that the bids be rejected, considered in corrected numerical order, or that the tracts involved be resubmitted at the next lease sale.

Continental protests . . . Continental Oil Co., which acts as the operator for the CATC group composed of Conoco, Atlantic Refining Co., Tide Water Associated Oil Co., and Cities Service Oil Co., protested any effort on the part of Kerr-McGee to "correct" its mistake. If the error is corrected by Interior Department officials, Kerr-McGee will top the successful bids of the CATC group on four tracts in the Vermilion area.

"Continental and other companies who submitted bids to the Interior Department in the prescribed manner did so in good faith and after substantial investments in exploration of these submerged lands," the company said.

"Thus, it appears to us unfair and unreasonable that anyone should contemplate rejecting those properly submitted bids on the thesis that one bidder claims to have made a mistake in submitting his bid."

A Sigh of Relief . . .

HOUSTON.—That rush of air you may have heard from the Gulf Coast area wasn't another hurricane forming—it was a collective sigh of relief.

Kerr-McGee's bid "mistake" caused some uneasy moments before it became generally known that an error had been made.

Kermac's mystifying and hefty bids on areas not even sought by other companies—or not wanted that badly—created an immediate impression that the firm had found something no one else knew about and had managed to keep it a deep, dark secret. More than one geologist and geophysicist working for a rival company had visions of "heads rolling" because he had missed what Kermac had apparently found.

The tracts on which Kerr-McGee bid high were Block 137, Eugene Island, for which it offered $350,000; the east half of Block 139, $350,000; Block 150, $500,000; Block 151, $500,000; Block 152, $2,666,000, and Block 167, $3,766,000, all off Eugene Island; Block 155 in Ship Shoal, $2,166,000; and Block 107, $200,000 and Block 128, $4,166,000, both in South Timbalier.

What Kerr-McGee intended to bid on, according to company officials, was all in the Vermilion area. They included Tracts 41 and 48, which went to Shell Oil Co. for $1,650,000 each; Tract 51, on which there were no bids; Tract 52, which went to the CATC group for $505,000; Tract 53, which also went to CATC group for $255,000; Tract 54, which went to CATC group for $765,000; Tract 55, CATC group for $2,256,000; Tract 56, which went to Gulf Oil Corp. for $401,000; Tract 57, which went to Shell Oil Co. for $2,062,000; and Tracts 59, 60, and 61, which went to the California Co. for $526,000 each.

Clark Clifford, attorney for Kerr-McGee, last week was preparing briefs to be filed with the department pointing out applicable laws and previous court decisions on the question of mistaken bids. Clifford said attorneys for the department had requested the briefs.

Rehearing Denied

U.S. Supreme Court refuses to reconsider Phillips case

WASHINGTON.—The Supreme Court will not reconsider its decision holding that the Federal Power Commission has the authority to regulate the selling prices of independent natural-gas producers and gatherers.

Its refusal of the petition of the Phillips Petroleum Co. for reconsideration was included in the first batch of orders handed down by the court as it opened its 1954-55 term.

As a result, the gas producers and gatherers will have to look to Congress for amendment of the Natural Gas Act. The effect of the June 7 decision made some 4,000 of them subject to FPC regulation.

No further definite steps by the commission to enforce its Order No. 174-A are expected until December, deadline of applications for certificates to sell gas to interstate pipelines.

Tax case . . . The court also refused to review the contention of the Metropolitan Petroleum Corp. that the higher oil import tax imposed when the Mexican reciprocal trade agreement was abrogated and the 1939 agreement with Venezuela was reinstated was invalid. The company argued that the doubling of the tax, from the 10½-cent rate under the Mexican agreement to 21 cents per barrel, violated limits on changes in duties and import taxes to 50 per cent. The company's contention was upheld by a U. S. Customs Court, but reversed by the Court of Customs and Patent Appeals. *(The Oil and Gas Journal, September 20, page 141.)*

Texaco Opposes Import Cut

WASHINGTON. — Legislative restrictions on crude-oil imports were strongly opposed by The Texas Co. in a brief filed last week with the Cabinet Committee on Energy Supplies and Resources Policy.

Such action, the company asserted, would reduce supply and tend to higher fuel prices for the consumer and would be "gravely prejudicial" to our economic and defense potential.

Pointing out that it is the second largest domestic crude producer and, with 80 per cent of its assets invested in the United States, firmly convinced of the need for keeping the domestic producing industry strong and growing, the company declared current cutbacks

in production are only temporary, and predicted that output will expand substantially within the next few months and lead to new all-time production records.

Imports enable the industry to "make flexible adjustments to long-run trends in America's petroleum requirements and to meet crucial emergency needs," the committee was told. "Any legislated restrictions would tend to rigidify the level of imports and eliminate this required flexibility."

Fuels Branch Killed

Bureau of Mines to change synthetic liquids program

WASHINGTON.—Reorganization of the Bureau of Mines will eliminate the synthetic liquid fuels branch, which has conducted the Interior Department's synthetic liquid fuels research and demonstration program.

The work on oil shale will be transferred to a new petroleum and natural-gas division, which will succeed the present petroleum and natural-gas branch. The work on synthetic fuels from coal will be turned over to a new solid-fuels division.

Roscoe A. Cattell, now head of the petroleum and natural-gas branch, will head the new division. A veteran of more than 34 years with the department, Cattell has directed research on helium and oil shale for some 20 years. At one time, he served as assistant superintendent and later as superintendent of the bureau's Bartlesville, Okla., experiment station.

Two experts to move . . . The bureau reorganization, designed to streamline its activity in conformity with recommendations submitted to Secretary Douglas McKay last summer by a team of industry experts, will put two of the bureau's well known oil experts in top posts of regional offices.

Harold C. Miller, who will be in charge in Region II, comprising California and Nevada, had experience in supervisory positions for oil and mining companies on the West Coast before joining the bureau in 1923. Since 1949, he has been regional director of the San Francisco Station.

Harold M. Smith will head the office for Region IV, comprising Arkansas, Louisiana, Kansas, Mississippi, Missouri, Oklahoma, and Texas. He has been with the bureau for more than 31 years, and directed much of the planning of the chemical laboratories erected in 1936-37 at the Bartlesville station. During World War II, he did outstanding work on jet propulsion fuels.

WATCHING WASHINGTON

Bertram F. Linz

Offshore Expectations High

Interior Department officials anticipate an eventual half-billion-dollar return from oil and gas development in the Outer Continental Shelf.

The first installment was an offer of more than $129,500,000 for the privilege of risking more money in development of leases off Louisiana. This was the total of the high bonus offers received by the department October 14.

From these leases the department will immediately begin to draw $3 a year per acre in rentals. Royalty payments will begin when oil or gas is found and production starts.

All told, the department received 326 bids aggregating $301,500,000. Whether the total bonuses to be received will be the $129,000,000 plus or some $15,000,000 less will depend on the department's position with respect to the bids of Kerr-McGee Oil Industries, Inc., which designated the blocks the company sought rather than the tracts as listed by the department. It was an honest error, and the department probably will recognize it as such. But if it doesn't, Kerr-McGee will find itself in possession of leases on some very nice but expensive fishing areas, which so far as is presently known are totally devoid of oil or gas.

Department officials are encouraged not only by the keen interest displayed in development of the submerged lands and the consequent revenue to the Government, but also by the fact that the sale marks the end of the long controversy which paralyzed development in the Gulf.

Merger Trend Watched

The Department of Justice is keeping a close watch on what is termed a "continuing trend towards mergers" in industry.

Asst. Atty. Gen. Stanley N. Barnes, head of the antitrust division, has warned industry of his intention to enforce the Clayton Act prohibitions against mergers that threaten to lead to monopoly.

The merger situation got into the news recently as a result of proposals for two mergers in the automobile industry and one in the steel industry, and reports that several other consolidations were being worked up. The department approved the automobile mergers but turned down the plan of two steel companies to amalgamate.

The department recently set forth the criteria on which it determines whether a merger proposal is in the public interest, as a guide to companies which planned consolidations.

Guilt By Association

Membership in trade associations which conspire to fix prices could be a violation of the Federal Trade Commission Act.

This was disclosed when the commission dismissed a complaint against 900 paper merchants belonging to some 22 trade associations which have been ordered to stop combining or conspiring to fix prices.

The commission made it clear that the dismissal was not a clean bill of health, but was made solely on the ground that an order was not required in the public interst. It did not pass in any way on the power or jurisdiction of the commission to bring "class suits."

"Guilt by trade association," Commissioner Lowell B. Mason called it.

He outlined the formula followed by the commission as follows: On the conspiracy side, prove a planned common course of illegal action by two or more members of a legal trade association. In order to avoid trying the rest of the members (and yet make them liable), serve only those two members under the allegation that they are truly representative of a class, namely, the rest of the membership in the trade association; allege that it would be manifestly impractical to serve the other members but name them by appending at the end of the complaint a list of all members of the association and all members of associations associated with it.

Since a penalty of $5,000 a day is provided for violation of a cease-and-desist order, businessmen who knew nothing of what was going on in their association could be faced with tremendous fines even before they knew they were involved in a case before the commission, he said.

Gas Line Protested

Panhandle Eastern charges plans will add to monopoly

WASHINGTON. — Charges that the American Natural Gas Co. is pursuing a "monopolistic program" in Detroit through its subsidiary, Michigan Consolidated Gas Co., were filed with the Federal Power Commission last week by the Panhandle Eastern Pipe Line Co.

The complaint declared the holding company's "restraint" in the Detroit area has cost consumers millions of dollars annually and will cost them more if American Natural is permitted to build the proposed American Louisiana pipeline.

Panhandle supplies more than 50 per cent of the gas sold by Michigan Consolidated and says it sells to that company at a price more than 40 per cent lower than Michigan Consolidated pays its own affiliate, Michigan Wisconsin Pipe Line.

Panhandle questioned the legality of the FPC conditional certificate granted American Louisiana for its 1,300-mile line from North Tepetate, La., to Detroit *(The Oil and Gas Journal, October 11, page 103).*

Protest details . . . Grounds for the protest were that there is no evidence as to the need for another affiliate of American Natural, and that the adequacy of American Louisiana's gas reserves are in doubt. This is apart from the question of whether American Louisiana's proposed suppliers intend to comply with the federal regulation growing out of the Phillips case.

Panhandle also contended the proposed line's financing plans are in doubt; the company has failed to demonstrate what the market for the proposed gas supply would be; and the FPC has not found that American Louisiana was "willing and able" to carry out its proposed service but has only decided that the promoters "may be" able at some future time.

Panhandle pointed out that it has been willing to negotiate with American to work out a solution of Michigan's gas problems but, it added:

"There is no incentive for the American Natural distributors to cooperate with Panhandle when they are assured that the commission will force Panhandle to supply their demands until such time as they are prepared to propose a new transmission line, and then be assured again that the commission will promptly approve such proposal, regardless of economics."

Requesting a stay of the certificate, which it said was granted by a 3-to-2 vote of the commission over the opposition of its staff and counsel, Panhandle charged that American's tactics have forced it into the position of being a standby source of gas for Michigan Consolidated.

Shale Policy Delayed

NPC group defers action for more committee study

WASHINGTON.—Secretary of Interior Douglas McKay will decide the future of the Government's oil-shale research program early next year —after the first 1955 meeting of the National Petroleum Council.

Interior department officials had hoped to make a decision this month on the basis of a study by an NPC committee headed by Maj. B. A. Hardey. The committee, however, postponed its report for further study. A subcommittee has reportedly prepared recommendations that the department drop its research program and dispose of the Rifle, Colo., experimental facilities to private industry.

It is this subcommittee's report that is under review by Hardey's full committee. It is slated for further study and action by the full committee before the first NPC meeting in January.

Storage report . . . Only one report was presented at the final 1954 meeting of the council. It dealt with petroleum storage capacity *(See page 71).*

The report revealed that more than 272,000,000 bbl. of crude and products are held in unavailable inventories and represent an investment of more than a billion dollars on which the industry gets no return. It showed also that the industry still requires about twice as much tankage as inventory because of the wide range of crudes used and products produced, in addition to varied methods of operation. Total storage capacity for crude, products, and residual was placed at 991,000,000 bbl. as of March 31 with an estimated 29,000,000 bbl. of capacity to be added before the end of this year.

Stewart Now Director

WASHINGTON.—Hugh A. Stewart last week dropped the "acting" from his title and became the full-fledged director of the Oil and Gas Division of the Department of Interior.

Carroll D. Fentress, second in command, was named assistant director.

Stewart has headed the OGD since it was reestablished when the Petroleum Administration for Defense was liquidated after the Korean conflict.

GATT Questioned

I.P.A.A. asks Government to modify trade agreement

WASHINGTON.—Legality of the General Agreement on Tariffs and Trade was challenged last week by the Independent Petroleum Association of America before the Committee for Reciprocity Information.

The agreement, the I.P.A.A. charged in a brief prepared by L. Dan Jones, assistant general counsel, violates the escape clause provisions of the Trade Agreements Act and, specifically, handicaps the Government in developing an effective solution of the oil import problem.

The association's views were submitted during hearings by the committee on proposed changes in the general agreement, including an extension of the period during which concessions cannot be modified or withdrawn, now scheduled to expire July 1, 1955.

Extensions of the freeze, Jones declared, would violate the escape clause provisions of the reciprocal trade agreement legislation, which provides that concessions shall be modified or withdrawn if necessary to afford relief to domestic producers or manufacturers.

Also attacked by Jones were the prohibition in the agreement against import quotas and the limitations on the so-called escape clause of the agreement itself.

Specific recommendations made by the I.P.A.A. were:

. . . Withdrawing all concessions granted in GATT on petroleum products.

. . . Removing the binding of the duty-free status of natural-gas imports.

. . . Lifting any restrictions on the right of the United States to establish import quotas.

. . . Terminating the freeze on modification or withdrawal of concessions.

. . . Modifying the escape clause provisions of GATT so that the United States will be free to take unilateral escape clause action, as required by the Trade Agreement Act.

. . . Making such other modifications in GATT as are necessary to give the United States complete freedom to treat unilaterally imports of crude petroleum, petroleum products, and natural gas.

Union Backed in Stock Case

WASHINGTON.—Corporations which have established stock purchase plans for their employees, to which the corporations contribute, were held by the National Labor Relations Board last week to be "under a duty" to bargain concerning the plans if asked to

by a union representing their employees.

In the first ruling of the board on this point, the Richfield Oil Corp., Los Angeles, was ordered to bargain with the Oil Workers International Union on changes in the agreement sought by the latter.

The company's stock purchase plan was started in April 1953 and the union almost immediately sought to bargain on it. The company refused to negotiate and the OWIU filed a complaint with the board last November.

The NLRB, by a vote of three to one, held that such a plan, when based on the employment relation and providing for company contributions, comes within the meaning of both "wages" and "other conditions of employment" as those terms are used in the Labor Management Relations Act, which requires an employer to bargain about those matters with the representative chosen by a majority of employees.

ROCKY MOUNTAIN

Proposal Amended

N. D. Natural application adds 12 towns to gas line

BISMARCK, N. D. — North Dakota Natural Gas Transmission Co. has filed an amended application with the Public Service Commission here for a certificate to build a 474-mile, $11,017,200 natural-gas pipeline from Tioga to Fargo to Grand Forks, N. D.

North Dakota Natural's new plan calls for firm gas service to 21 North Dakota cities instead of 9 as proposed in the company's original application, which was dismissed by the commission earlier this year. By meeting the deadline for filing new exhibits, N. D. Natural is assured a hearing November 16 on its revised plan, a commission spokesman said.

The original facilities, which would have cost $10,700,000, would have served Stanley, Minot, Velva, Harvey, Carrington, Jamestown, Fargo, Devils Lake, and Grand Forks. The new plan adds Berthold, Drake, Anamoose, Fessenden, Sanborn, Valley City, Tower City, Casselton, Southwest Fargo, Sheyenne, New Rockford, and Larimore.

Amount . . . N. D. Natural would take 30,000 M.c.f. per day under a pressure of 700 psi. at Signal Oil & Gas Co.'s Tioga gasoline plant.

The pipeline would consist of 78 miles of 12-in. from Tioga to Minot; 101 miles of 12-in. from Tioga to Velva; 170 miles of 10-in. from Velva to Fessenden, from Fessenden to Jamestown, and from Jamestown to Valley City; 58 miles of 8-in. from Valley City to Fargo; 126 miles of 8-in. from Fessenden to Tokio and Grand Forks; 15 miles of 4½-in. from Tokio to Devils Lake; and 10 miles of 3½-in. from the trunk line to New Rockford.

New contract . . . A new contract with Amerada Petroleum Corp., which controls bulk of casinghead gas produced in the Tioga area oil fields, softens N. D. Natural's obligations to buy additional gas beyond the 25,000,000 cu. ft. originally contracted for, and also eases the pipeline company's obligations in the event its market drops below 25,000,000 cu. ft. daily.

Also eliminated from the new contract is an escalator clause tied to the price of No. 6 fuel oil at Houston, with substitution of the Bureau of Labor statistics index of wholesale prices as a price barometer.

The changes had been required by the commission in a set of conditions attached to certification before dismissal of the original application.

GULF COAST

Big Gas Line Ready

Gulf Interstate to begin operations on November 1

RAYNE, La.—Gulf Interstate Gas Co. will begin moving 375,000,000 cu. ft. of natural gas daily through its recently completed 845-mile, 30-in. main line from southern Louisiana to near Ashland, Ky., on November 1.

The construction on the transmission line and the 309 miles of various-size gathering lines cost $130,000,000. It took more than a year to complete the project.

The last of five $3,000,000 compressor stations was opened to 1,500 people from here and surrounding communities as Gulf Interstate endeavored to further community relations and to acquaint the public with how its system operates. Previously, more than 14,500 people had attended open houses held by the company at its other compressor stations at Delhi, La., Banner, Miss., Hampshire, Tenn., and Clementsville, Ky.

Rayne is the starting point for the new line. The 3 to 24-in. gathering lines carrying gas from southern Louisiana wells funnel into the 30-in. artery where compressors boost gas pressure from 675 psi. to 935 psi. operating pressure. The high-pressure gas supply sometimes reaches 7,000 to 8,000 psi. at the wellhead.

Each of the five stations contains four 2,000-hp. compressors.

New Louisiana Depth Record

NEW IBERIA, La.—Prolific, deep-producing Weeks Island field, 15 miles south of here, has a new "world's second deepest producer."

It is Humble Oil & Refining Co. 2 Rita Provost-Minvielle, which tested commercial gas-condensate production from a casing-perforated interval at 17,530-54 ft. in Miocene sand. Flow through ¼-in. choke was at the rate of 216 bbl. of 43.4°-gravity condensate and 4,975,000 cu. ft. of gas per day with pressure of 4,000 psi.

Depth of the producing interval still lacks approximately 340 ft. of equaling that of the world's deepest producer completed late in 1953 by Richfield Oil Co. in North Coles Levee field, Kern County, California.

It is 248 ft. deeper than the previous second deepest well, Shell Oil Co. 2 Gonsoulin-Minvielle-State, located approximately ½ mile to the west.

CATC Asks Platform Permit

NEW ORLEANS.—Continental Oil Co. has asked Army Engineers Corps here for permission to install permanent-type drilling platforms about 22½ miles southwest of Grand Isle off the coast of Louisiana.

It is in this area that the company, operating for the CATC Group (Conoco, Atlantic Refining Co., Tide Water Associated Oil Co., and Cities Service Oil Co.), plans to install a huge self-contained platform in 97 ft. of water. The group is planning an extensive development program on a block of leases held by the four companies for a number of years.

Humble Oil & Refining Co. also is active off Grand Isle, but closer to shore. It is drilling 14 development wells about 8 miles from Grand Isle.

Conoco Has Gulf Discovery

NEW ORLEANS.—Continental Oil Co. apparently has uncovered another new oil field 4 miles offshore in the Mississippi River delta sector of Plaquemines Parish, Louisiana.

Continental's 6 State Lease 979, flowed at the rate of 182 bbl. of 42.7°-gravity oil per day through ⅛-in. choke while testing a 12,300-ft. Miocene sand. Hole, with casing run to 12,711 ft., is plugged back from total depth of 14,625 ft. The discovery, in Block 54, West Delta Area, is approximately 3 miles west of the company's West Delta Block 52 field, nearest production.

A HUGH COLISEUM at Odessa wasn't finished for this year's Permian Basin Oil Show, but stood as a reminder that bigger and more permanent things are in store for future shows.

Attendance tops 141,000 at . . .

Permian Basin Oil Show

Robert J. Enright

ODESSA.—More than 141,000 persons, mostly from within the Permian basin, swarmed through the 1954 Permian Basin Oil Show here.

Attendance at the show, billed as the world's biggest single observation of Oil Progress Week this year, was up about 34,000 over that of the last exposition held in 1952.

Firms exhibiting equipment at the attraction numbered 392 this year, as compared with 228 in 1952. Most of the exhibits were of drilling and production equipment—as might be expected with a reported 450 rigs running and 40,000 wells producing within 200 miles of Odessa.

Drilling and workover rigs, well-servicing units, pumping units, a great variety of bits, centralizers, scratchers, fishing tools, and other drilling tools, slush pumps, power units, and perforating, fracturing, acidizing, and cementing units were scattered over the new 66-acre show site in great profusion.

In many instances, newly developed equipment was exhibited for the first time. One new portable rig, designed primarily for workover operations to a maximum depth of 15,000 ft. but suitable for drilling to about 6,000 ft., presented something new in trailer mounting. According to its maker, the rig was built to fit the trailer, rather than vice versa as is conventional practice. The resulting compact unit is claimed to be considerably stronger and more maneuverable than other conventional types of portable rigs.

Boom town popular . . . One of the greatest attractions at the show this year was a carefully planned haphazard-looking version of a typical early American oil boom town.

Items contributed by oil companies for the project included false-fronted buildings, an ancient life-size cable-tool rig, one of the first horse-operated rotary tables ever built, old wooden tanks, and antiquated rolling stock. Manpower, materials, and know-how for construction also were supplied primarily by producing firms in the Odessa area.

The reconstructed boom town boasted old-time barber and print shops, saloon, sheriff's office, and "Bijou" theater, where the Oil Industry Information Committee of the American Petroleum Institute showed its newest movie, "The Story of Colonel Drake."

The old drilling equipment and other relics will be retained and exhibited in a permanent Permian basin oil-field museum to be erected on the show grounds.

Reception . . . The big 4-day attraction started with a 2-hour, 3-mile-long parade down Grant Street, Odessa's main drag.

About 50,000 persons watched 17 bands, dozens of floats, four sheriff's posses, and the various motorized oil equipment which participated.

Opening of the show coincided with arrival of the area's first mild norther of the year. The latter caused at least one exhibitor considerable grief when strong winds flattened the tent housing the firm's exhibit—an aerial survey map of the entire southern half of the United States and claimed to be the world's largest—prior to the official opening of the show.

Exhibitors' reaction to the show was in the main enthusiastic. Most contacted said their displays were being visited by many oil men interested in buying. Exhibitors and out-of-town spectators also expressed pleasure in the lack of price gouging on the part of local labor and business organizations.

Big Foot Project Planned

AUSTIN.—Shell Oil Co. plans an experimental 6-month pressure-maintenance project calling for injection of casing-head gas into a sand with ex-

tremely low permeability in Big Foot field, Frio County.

Shell has asked the Texas Railroad Commission for permission to inject from 20 to 50 M.c.f. of gas daily through one injection well into the Olmos "B" sand in the field. The input well would be in the approximate center of the 635-acre lease.

Shell figures an injection pressure of about 2,000 psi. may be necessary for the gas to penetrate the Olmos, which has an average permeability of about 3 md.

The company asked permission to expand the project by adding more input wells if the pilot performs satisfactorily.

Production from the reservoir, according to J. H. Goatley, Shell spokesman, reached 4,576,712 bbl. as of August 1. The pool was discovered in 1949.

SACROC Operating

Full-scale water flooding now under way at huge unit

AUSTIN.—The Texas Railroad Commission last week restored wells in Kelly-Snyder field of Scurry County to statewide allowable status with the initiation of full-scale pressure-maintenance operations in the field.

In a way, the action was academic, since Kelly-Snyder has been permitted to produce 15 days each month, and the statewide allowable figure has been fixed at 15 days for the past 3 months. However, under the ruling the field will reap the benefit of any future increase in the statewide producing-day pattern.

Kelly-Snyder was welcomed back by the commission on the basis of evidence presented at the October allowable hearing by E. L. Anders, chief engineer of the SACROC unit.

Status of project . . . H. H. Allen of SACROC told the commission the main water-injection system, presently comprising 53 injection wells, was placed in operation when the unit received commission approval of the last 64 of the unit's 203 transfer-of-allowable applications.

Water was being injected at a rate of 161,687 bbl. daily as of October 11, he said. This represents 147 per cent of reservoir withdrawals. The input rate is being increased as rapidly as possible to the full design figure of 200,000 bbl. daily.

To illustrate the situation in terms of oil production, Allen said that the field could produce 22 days a month and the production rate would still result in no net reservoir voidage.

Allen estimated that more than 4,000,000 bbl. of water had been injected into the Canyon Reef producing formation of the huge 50,000-acre unit as of October 19.

The SACROC project is the world's biggest pressure-maintenance project from the standpoint of acreage.

Ranch Deal Signed

Tide Water will seek deep production in Pecos County

MIDLAND, Tex.—Tide Water Associated Oil Co. has negotiated a deal with White Eagle Oil Co., Midland, and Panhandle Oil Corp., New York, whereby Tide Water will undertake an intensive exploration program for deep production on the White & Baker ranch in eastern Pecos County.

Operations will be conducted in a 30-section area on the western side of the huge 40,000-acre ranch. White Eagle and Panhandle are joint owners of the oil and gas lease on the entire property.

Production has been established in the shallow Queen sand at around 2,000 ft. but only four deep Ellenburger wildcats have been drilled on the acreage. All were dry in the Ellenburger, but one was plugged back and completed as a small producer in the Strawn sand.

Terms of the deal give Tide Water 9 months to carry out seismic operations, first ever conducted on the ranch. The company then may select three drilling blocks from the 30-section area.

If Tide Water exercises its option, it must drill Ellenburger wildcats (9,500 ft. or deeper) at 90-day intervals on each of the blocks. The drilling blocks selected would be checkerboarded in 80-acre tracts. Tide Water would be given 3-year leases on its 80-acre tracts, with White Eagle and Panhandle retaining the others. White Eagle and Panhandle would retain a one-sixteenth overriding royalty on the Tide Water leases.

The contract also provides that if Tide Water exercises its acreage selection option and fails to drill the wildcats called for, the company would pay White Eagle-Panhandle $50,000 for each such failure.

Texas Allowable Raised

Railroad Commission criticizes importers and refiners, allows 15-day November output to add 76,558 bbl. daily

AUSTIN. — Refiners and importers took a verbal pasting here last week as the Texas Railroad Commission granted purchasers desires for a moderate 76,558-bbl.-daily increase in the Texas crude-oil production allowable for November.

The allowable was increased 76,558 bbl. daily over that in effect October 9 when the commission retained for the 30-day month of November the 15-producing-days schedule in force for 31-day October.

Purchasers were almost unanimously in favor of the increase.

Criticism of importers and refiners was voiced by Commissioner Olin Culberson for failing to maintain what he termed the delicate balance between production, importing, and refining rates. Excessive importing and refining rates, he said, must share the entire responsibility for the undue strain on storage capacity. Positive proof of this, he said, lies in the present "unreasonably and unseasonably high stocks of gasoline."

Culberson warned domestic production will have to be cut even further back next spring if imports and refinery yields of gasoline are not trimmed substantially.

Caution urged . . . Culberson warned oil men not be too optimistic if demand shows an increase in October.

Demand for September, he said, was off 2.7 per cent from September 1953.

The explanation, he said, lies in the fact that in September last year there was a heavy movement of distillates from primary to secondary and consumers storage. Apparently this distillate movement hasn't taken place as yet this year, due to unseasonably warm temperatures. It is reasonable to expect that even with normal weather in October, demand will show a pronounced gain. Thus the demand picture over a short period will probably be distorted.

Underproduction question . . . Actual Texas crude production as of October 9 was 2,597,575 bbl. daily, according to Commission Chairman Thompson, compared with an allowable on the same date of 2,788,191 bbl. daily.

In view of the underproduction figure, Joe Owens of Sun Oil Co. ques-

tioned whether it wouldn't take a 16-day schedule, or an allowable increase of about 180,000 bbl. over the October 9 figure, to actually meet purchasers' nominations.

Thompson answered that the market would be flooded with oil within 2 months if the commission permitted production of as much crude as buyers nominated. Commissioner William J. Murray, Jr., explained that long-range experience has shown that purchasers' nominations normally exceed actual demand by about the same margin that allowable exceed production, or about 10 per cent.

NOVEMBER ALLOWABLE

District—	November	Increase from Oct. 9
1—Southwest	53,474	1,072
2—Gulf Coast	136,581	4,506
3—Gulf Coast	446,220	9,920
4—Southwest	243,929	5,870
5—East Central	44,928	1,146
6—Outside E. Texas	114,228	3,577
6—East Texas field	212,072	6,439
7-B—West Central	154,648	4,710
7-C—West Central	201,680	6,378
8—West Texas	900,676	26,140
9—North Texas	250,305	6,076
10—Panhandle	106,008	724
Total	2,864,749	76,558

Palo Duro to Be Tested

Two deep tests scheduled in Texas Panhandle basin in new drive to find production; wildcat also slated in Anadarko

AMARILLO.—Oil men are going to take another try at unproductive Palo Duro basin, which is located in the southern Texas Panhandle and near the productive Anadarko basin.

One of the deep tests is located 2 miles southwest of Clarendon in southwestern Donley County, 26 miles south of Panhandle field production (A on map). It is Rip C. Underwood and Corsica Oil Co. 1 Carpenter in Section 5, Block G-7, Adair & Goodnight Survey. The operators are expected to take the exploratory well to 6,500 ft. or granite.

The nearest previous test to this prospect is Placid 1 Kelley, 11 miles southwest. It was a granite failure. Location for the new wildcat was picked on seismic data. It is located near the center of a block farmed out by Phillips Petroleum Co.

The other Palo Duro basin test is located in Briscoe County (B on map). It is Tule Producing Co. 1 Cogdell, 18 miles north of Silverton. This 7,500-ft. project is 1½ miles northwest of Humble 1 Adair Estate, a 4,010-ft. dry hole. Nearest production is in Panhandle field, about 40 miles to the north. Location of the 1 Cogdell is in Section 62, Block A-1900, SF Survey 2518.

Palo Duro basin . . . This depositional basin lies in the southern part of the Texas Panhandle. It is separated from the Anadarko basin by the Amarillo buried mountains. The structural low is named for the Palo Duro Canyon of Briscoe, Armstrong, and Randall counties. The basin is bounded on the south by the Matador arch and on the northwest by the Bravo dome. It has no production.

More deep work . . . Deep exploration in the Texas Panhandle has highlighted this area's development this year. Most of this deep work has been in the Anadarko basin.

The latest deep test announced for the Anadarko basin is in northwest Hemphill County, 2½ miles northwest of Canadian (C on map). It is Sun Oil Co. 1 Dale Nix, an 11,800-ft. wildcat in a rank, dry county. The test, located in Section 81, Block 42, H&TC Survey, is on a farmout from Hunt Oil Co. Sun has about 25,000 acres within an 8-mile radius of the new well site. The wildcat is being supported by Hunt, Skelly, and Cities Service.

Nearest production is Lips Ranch field, about 23 miles northwest. It is 8 miles southwest of a Douglas sand dry hole at Freeman 1 Wayne Cleveland.

CANADA

Prices Adjusted

Light crude figures drop as dollar value increases

REGINA. — Imperial Oil, Ltd., has adjusted the price for most western Canadian light crude oils down 9 cents a barrel due to the increased value of the Canadian dollar in comparison with the United States dollar.

The adjustment resulted in a drop in the price of gasolines, diesel and light-fuel oils.

In Saskatchewan the wholesale price of all three grades of gasoline have been reduced by one-half a cent a gallon while diesel fuel and light oils have been reduced by one-fifth of a cent.

The drops in the Regina area mean that the wholesale price of Grade 1 gasoline will be reduced from 24.2 cents a gallon to 23.7 cents and Grade 2 gasoline from 21.7 cents to 21.2 cents. Fuel oil will drop from 16.1 cents a gallon to 15.9 cents and diesel fuel will be 17 cents a gallon, down from 17.2 cents.

The price of Turner Valley crude has been dropped another 26 cents for a total adjustment of 35 cents. The new Turner Valley price is $2.89½ a barrel.

Other new prices per barrel include: Redwater, $2.55½; Leduc-Woodbend, $2.66½; Golden Spike-Acheson-Stony Plain, $2.60½; and Excelsior, $2.56.

Polyethylene Plant Opened

EDMONTON.—Canadian Industries Ltd.'s expanded polyethylene plant here has been officially opened.

The plant, the only polyethylene plant in the British Commonwealth outside the United Kingdom, has been expanded from a capacity of 12,000,000 lb. to 16,000,000 lb. annually. The plant's capacity is equal to Canada's consumption.

The expansion cost $15,000,000.

Shell Tops Leasing

EDMONTON.—Shell Oil Co. paid the Alberta government $469,349 for the drilling reservations on two tracts about 65 miles east of Peace River. Shell acquired the permits in a recent provincial sale which saw 41,796 acres of reservations go for $576,304.

Shell paid $311,451 for a reservation on 5,920 acres and $157,898 for a reservation on 6,080 acres, both located in the same area of northwestern Alberta.

Firms Schedule Rise in . . .

Crude, Products Imports

CRUDE and products imports for the next 4 months will average about 4.9 per cent more than for the corresponding months last winter, if the importing companies' estimates to the Texas Railroad Commission prove to be accurate.

Actual imports, reported by these companies for September, averaged 903,800 bbl. daily, down 45,200 bbl. daily from the average for September last year but up 31,500 bbl. daily from August. Most of the gain over August was due to the seasonal increase in imports of heavy fuel. The gain in heavy fuel was 29,700 bbl. daily compared to a gain of 1,800 bbl. daily for crude.

Company reports indicate a total import average of 1,163,400 bbl. daily for next January and February, up 6.2 per cent from the same months this year. The increase for these months will be due to higher imports of crude. Crude will be up 14.2 per cent in contrast with the reduction of 4.7 per cent forecast for products.

CRUDE AND PRODUCT IMPORTS*
(Thousands of barrels daily)

	1953	1954
September (Actual)	949.0	903.8
October (Forecast)	1,015.3	1,018.8
November (Forecast)	1,042.3	1,091.5
December (Forecast)	1,062.3	1,091.1
	1954	**1955**
January (Forecast)	1,099.6	1,166.2
February (Forecast)	1,090.4	1,160.3

*From company reports.

These Are Company Import Estimates

(Thousands of barrels daily)

	Actual*		Estimated or forecast*				
	Aug. 1954	Sept. 1954	Oct. 1954	Nov. 1954	Dec. 1954	Jan. 1955	Feb. 1955
CRUDE—EAST COAST:							
Atlantic Refining Co.	54.3	78.5	60.2	60.2	60.2	60.2	60.2
Cities Service Co.	14.3	11.9	13.1	30.7	19.4	21.6	30.4
Corpus Christi Rfg. Co.				3.7		3.6	
Eastern States Pet. Co.	10.8	0.7	5.3	5.3	5.3	5.3	5.3
Gulf Oil Corp.	121.0	110.0	124.0	131.0	134.0	140.0	140.0
McBride Oil & Gas Corp.			3.2	6.7	6.5	6.4	7.2
Phillips Petroleum Co.	6.4	12.9	8.9	9.2	8.9	8.9	9.8
Sinclair Oil Corp.	67.2	70.5	66.0	66.0	66.0	66.0	66.0
Socony-Vacuum Oil Co.	89.6	96.9	81.0	79.0	80.0	80.0	80.0
Southwestern Oil & Rfg. Co.		3.7	6.4	3.6	3.5	3.6	3.9
Standard Oil Co. of California	75.0	66.7	77.5	77.5	77.5	77.5	77.5
Standard Oil Co. (Ind.)	13.3	15.4	16.8	13.6	6.8	6.8	14.6
Standard Oil Co. (N. J.)†	78.0	75.0	79.0	79.0	79.0	79.0	79.0
Sun Oil Co.	10.8	8.1	14.5	7.5		14.5	8.0
The Texas Co.	54.9	53.6	37.3	57.8	53.1	60.7	57.0
Tide Water Associated Oil Co.	9.7	8.7	20.4	7.0	14.7	6.8	15.9
Total East Coast	605.3	612.6	613.6	637.8	614.9	640.9	654.8
CRUDE—WEST COAST:							
Socony-Vacuum Oil Co.			7.8	17.8	16.8	26.5	26.5
Standard Oil Co. of California	22.3	9.3	18.8	18.8	18.8	18.8	18.8
The Texas Co.	9.7	11.3	9.8	10.2	9.8	11.3	10.0
Tide Water Associated Oil Co.	16.9	22.8	12.9	12.1	12.9	18.0	18.0
Total West Coast	48.9	43.4	49.3	58.9	58.3	74.6	73.3
Total crude	654.2	656.0	662.9	696.7	673.2	715.5	728.1
PRODUCTS:							
Asiatic Petroleum Co.	1.0	7.1	5.0	4.0	7.0	8.0	5.0
Eastern States Petroleum Co.	15.8	8.2	9.0	9.0	9.0	9.0	9.0
Gulf Oil Corp.	4.0	8.0	3.0	7.0	4.0	4.0	4.0
Shell Caribbean Pet. Co.‡	64.0	93.0	115.0	135.0	165.0	175.0	165.0
Shell Oil Co.	14.4	17.1	15.4	20.8	21.4	22.8	21.0
Sinclair Oil Corp.	3.0	1.6					
Socony-Vacuum Oil Co.	6.9	6.7	9.1	9.1	9.1	9.1	9.1
Standard Oil Co. (Ind.)§		10.1	18.4	25.4	21.4	21.4	20.1
Standard Oil Co. (N. J.)†	109.0	96.0	181.0	181.0	181.0	193.0	193.0
The Texas Co.				3.5		8.4	6.0
Total products	218.1	247.8	355.9	394.8	417.9	450.7	432.2
Total crude and products	872.3	903.8	1,018.8	1,091.5	1,091.1	1,166.2	1,160.3
Bonded fuel included¶	51.9	76.0	67.6	72.3	72.3	65.8	62.7

*From company reports to the Texas Railroad Commission. †Based on quarterly estimates. ‡Imported by independent distributors. §Received through suppliers who can furnish either domestic or foreign oil. ¶Mostly duty free for bunkering ships in foreign trade.

Imports, Exports Dip

August imports 7 per cent under average for 7 months

CRUDE and product imports in August dropped 7.1 per cent below the average for the first 7 months of the year, according to data released by the Census Bureau of the Department of Commerce.

Total imports for August averaged 969,000 bbl. daily, including 660,000 bbl. daily of crude and 309,000 bbl. daily of products. The daily average for total imports in the first 7 months was 1,042,000 bbl. daily.

Crude imports for August averaged 3.3 per cent more than in the first 7 months, but product imports dropped 23 per cent below the 7-month average.

Exports averaged 286,000 bbl. daily in August or 8.3 per cent less for the first 7 months.

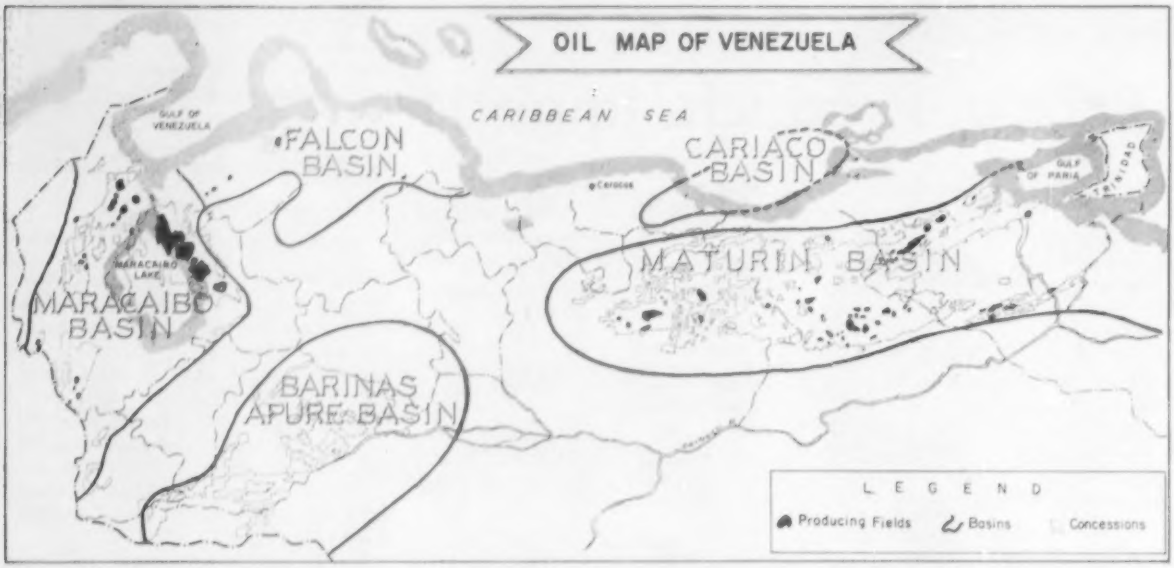
IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	Aug. 1954	July 1954	Aug. 1953
Crude—			
Mexico	294	47	378
Colombia	1,030	1,069	1,317
Venezuela	10,646	10,092	10,109
Peru		120	
Trinidad	115		
Kuwait	3,889	4,497	2,778
Saudi Arabia	2,759	2,652	3,142
Iraq	283		
Qatar	337	183	121
Canada	105	199	313
Far East	996	1,520	967
Total crude	20,454	20,379	19,125
Daily average	660	657	617
Products—			
Residual fuel	7,708	8,382	7,394
Other products	1,889	1,600	983
Total products	9,597	9,982	8,377
Daily average	309	322	270
Total all oils	30,051	30,361	27,502
Daily average	969	979	887

IMPORTS*

	Aug. 1954	July 1954	Aug. 1953
Crude	1,349	1,073	1,321
Gasoline	2,253	2,322	2,508
Kerosine	77	397	381
Distillate	1,412	1,695	1,445
Residual	1,580	1,883	1,727
Lube oils	1,347	1,271	1,118
Other products	849	920	802
Total all oils	8,867	9,561	9,302
Daily average	286	308	300

*Excludes shipments to territories.



Venezuela Offers Concessions

- **Government accepts bids in secretive move indicating new policy to attract large sums of foreign oil money**

- **U. S. and French firms show interest in exploration rights which would be first granted in nearly 10 years**

Dahl M. Duff

THE Venezuelan Government received bids last week for the first oil concessions to be granted in that country in nearly 10 years.

Areas offered were so-called "free" acreages, or tracts not previously under concession. The new concessions will not include the national reserves consisting principally of the 50 per cent acreage required to be turned back to the government when concessions are converted after production is found.

Concessions offered cover large areas of prime exploratory interest in all parts of the country—eastern Venezuela, the western section, the Barinas-Apure basin, Gulf of Venezuela, and in highly productive Lake Maracaibo itself.

Although bids had not been revealed, one estimate was that bonus offers submitted to the government would run into several hundred million dollars. Additional millions undoubtedly will be bid if the government offers the national reserves, or part of them, as it is expected to do later.

Interest high . . . One report indicated a group of Southwest independent oil men had raised $50,000,000 and planned to bid for some of the acreage.

In addition to the 11 companies now operating in Venezuela, several other United States companies were said to be in on the bidding. They include Cities Service Co., Superior Oil Co., Southern California Petroleum Corp., and Conorada Petroleum Corp. (Continental Oil Co., Ohio Oil Corp., and Amerada Petroleum Corp.).

Another potential newcomer to Venezuela is Tide Water Associated Oil Co., which is reported to have had representatives in Venezuela preparing applications for concessions.

French interests, particularly the partially government-owned Cie. Francaise des Petroles, also were understood to have made offers. A French organization known to be interested in Venezuelan operations is a group backed largely by Suez Canal Co. money. Michel Momolle, a representative of this group, visited Venezuela last March.

Delay expected . . . It likely will be the first of the year or later before any concession grants are made as result of the offers submitted last week. The government is expected to take at least until then to analyze and consider the various proposals.

Reports were that Dr. Edmundo Luongo Cabello, the minister of mines and hydrocarbons, was authorized earlier this month by the president, Marcos Perez Jimenez, to go ahead with new concession agreements, and it appeared the government this time was ready actually to make acreage awards.

In the fall of 1951, the government invited offers but never took further action after receiving proposals reported to have totaled about $150,000,000.

The government called in company representatives last February and took tentative proposals for new concessions. This step, however, was largely exploratory on the part of the government and not binding on the companies.

In taking action at this time, the government apparently is interested in large amounts of immediate revenue. Although the direct revenue from current oil operations in Venezuela amounts to about $400,000,000 a year, Venezuela is carrying out a large public-works program, and even greater sums are needed for these improvement projects. The government has recently been investigating the possibility of building a petrochemical industry, among other things.

Big bonuses? . . . Although some pres-

ent concessions in Venezuela provide for royalties much higher than the minimum one-sixth, it was reported that the government discouraged high royalty bids this time, thus placing the competition mainly on a bonus basis. As far as is known, the government has indicated no intention of including refining obligations as was done 10 years ago.

Acreage awards are to be made on the basis of national interest, and it has been generally anticipated that Venezuela would seek to broaden the base of its industry by bringing in other responsible companies, especially those with market outlets for the production they might develop.

Some 36 per cent of Venezuela's oil is sold in the United States. Much of this is heavy fuel oil which dovetails into the pattern of production and refinery operations in the United States.

Politics . . . However, last year's import controversy and the threat of curbing oil shipments are still fresh in the minds of Venezuela's leaders. The government may reason that Venezuela's position would be somewhat improved if additional and smaller United States companies were producers of Venezuelan oil.

During the past 5 years many reasons for opening up new concession areas in Venezuela have been advanced by the industry. Although Venezuela's crude reserves, which were 10,152,000,000 bbl. the first of the year, have shown substantial year-to-year additions, the proportion of reserves to production is far less than in other large oil-exporting countries, especially in the Middle East. Concession conversions during the past 9 years have left the operating companies in Venezuela with mostly exploitation acreage.

The total area held under concession in Venezuela amounts to about 15,500,000 acres, but this is only 17 per cent of the country's sedimentary basin area which is estimated to total about 86,450,000 acres. About 57 per cent of the concession acreage is held by the three major operators, Creole Petroleum Corp., Royal Dutch-Shell, and Mene Grande Oil Co. These companies account for about 88 per cent of Venezuela's total oil production.

The call for concession offers made heavy financial demands on the participating companies. Although most of the companies in the bidding are major operators with large resources, capital requirements for other activities were expected to hold down the size of some of the offers.

Move kept quiet . . . Notification that applications for new concessions would be received up to October 22 was given quietly and without public announcement by the government. One reason for this is the fact that the government is anxious to avoid bids from "go-betweens" and parties who are more interested in reselling acreage rights than in actual operations.

As an indication of what Venezuela may be offered for its new acreage, one official pointed to the recent sale in which the federal Government was offered approximately $129,000,000 for 97 leases off the Louisiana coast. Although costs of operation in Venezuela are high, the country provides the most attractive areas in Latin Ame.ica for oil exploration.

Closed-door policy . . . The policy of granting no further oil concessions was adopted in Venezuela by the Accion Democratica after it came to power in October 1945. Since the army group succeeded the Accion Democratica in November 1948, the concession issue has been the subject of intermittent public discussion, although no official statement has been made by the government itself.

The issue was raised in the summer of 1953 by Dr. Arturo Hidalgo, a prominent petroleum engineer in Venezuela, who advanced a number of arguments why the country should offer new oil concessions. He pointed out that while Venezuela was closed large amounts of oil capital were moving into other foreign countries, including Peru, Colombia, and especially Canada. He attacked as foolish the view that Venezuela should wait until other countries exhaust their reserves before granting new concessions, and urged more exploration to find light oil to diversify production.

The basic Venezuelan petroleum law of 1943, under which concessions will be granted, is considered one of the best pieces of oil legislation in force abroad, although there has been some criticism of the government's past policy of linking a refinery obligation to the granting of new areas. The law provides two types of concession—exploration-exploitation and exploitation—and sets up an exploration period of up to 3½ years, after which one-half of the

LAKE MARACAIBO is in the heart of Venezuela's richest oil basin. Maracaibo Basin fields account for about two-thirds of the country's daily production of 1,900,000 bbl.

CARACAS, Venezuela's capital, has prospered with the advent of oil wealth.

area of each concession reverts to the government.

Royalties and taxes . . . The maximum area for exploration-exploitation concessions is 10,000 hectares, or 24,710 acres, but larger blocks consisting of individual concessions can be granted. On the one-half retained by the operator, an initial exploitation tax and an annual surface tax becomes payable, including usually a bonus. The exploitation period runs for 40 years. National reserves are granted as straight exploitation concessions only after being advertised for bidding in the Official Gazette.

The law provides for a minimum royalty of one-sixth, but royalties range up to the 33⅓ per cent which Phillips agreed to pay on certain national-reserve acreage in Monagas.

These higher royalty payments were negotiated under a provision in the law which authorizes the government to obtain special advantages or considerations for the nation. Under this, except in a few special cases, an agreement to refine within Venezuela the equivalent of one-tenth of the oil produced from new concessions became a requirement after 1943. The rule was applied only to new concessions. The provision required that none of the remaining nine-tenths of such production could be refined in the Caribbean area outside Venezuela.

Since 1948, Venezuela has had an income tax law which gives the government 50 per cent of company profits. The government's cut, however, includes royalty payments, rentals, and other taxes, with the result that the income tax has been felt primarily by the three largest producers—Creole, Shell, and Mene Grande.

The net split with the government is after expenses, which presumabily includes bonuses offered in last week's bidding.

Rotary Rigs Increase

Drilling activity in free world countries outside Canada, United States increases with indications of more to come

THE number of rotary rigs in operations in non-Communist countries outside the United States and Canada has shown a further increase over the last 6 months.

Available information on world-wide drilling activity indicates rotaries in operation in these areas last month totalled nearly 690. This compares with 662 last March and 632 in July 1952.

The compilation, on the basis of reports from the main centers of field operations, shows that no abrupt changes in the rig operating total occurred in any of the large foreign oil-producing countries. Normal shifts in exploratory interest and in the pace of development activity account for the dropping of rigs in some areas and additions in others.

The number of rigs operating in the United States and Canada as of September 1 was 2,460, including 2,332 in the United States. Thus, active rotary rigs in all free world countries as of September numbered approximately 3,120. The figures on active rotaries abroad, however, are in general not as precise as those for the United States and Canada due to the difficulty of obtaining accurate and up-to-date information on some foreign areas.

More indicated . . . The outlook is for a further upsurge of drilling activity in foreign countries over the next year or two. Preliminary exploratory work is advancing into the drilling stage in a number of countries, including Turkey, East Africa, western Egypt, Israel, Cuba, and Australia.

A number of important foreign oil developments in recent months hold the prospect of renewed or expanded drilling programs. The new international eight-company consortium to operate in southwestern Iran will in all probability inaugurate exploratory and development work in its operating area. Oil discoveries during the last year in Sicily, southwestern France, and western Australia have encouraged new activity in these countries.

The Venezuelan Government's call for bids on new concessions in that country foreshadows a higher level of drilling activity. If concessions are granted as expected, drilling will get under way quickly in areas where geological and geophysical work has already been carried out. New acreage grants in Venezuela could easily lead to the addition of 10 or more strings for the broadened exploratory operations.

The possibility of the entrace of foreign operators into Argentina on some type of contract basis would give impetus to Argentine activity. The Peruvian Montana is now being extensively explored by about 10 different companies. These long-range programs, though still largely in the geological stage, will eventually require drilling for the final testing of whatever favorable prospects are located.

ROTARY RIGS OUTSIDE THE U. S.

(Excluding Communist-Controlled Areas)

Country—	September 1954	March 1954	July 1952
Alaska	3		
Cuba	2	1	1
Mexico	82	82	80
Total	87	83	81
South America:			
Argentina	47	45	45
Barbados	1	1	
Bolivia	6	5	2
Brazil	8	8	5
Chile	5	5	5
Colombia	22	23	17
Ecuador	9	9	11
Peru	21	22	22
Trinidad	27	27	27
Venezuela	107	110	122
East. and Cent.	66	64	60
Western	41	44	62
Total	253	255	256
Western Europe:			
Denmark			3
British Isles	7	6	8
France	26	25	31
West Germany	106	100	95
Italy	32	30	20
Netherlands	6	6	4
Portugal	2	2	2
Spain	3	2	3
Total	182	171	166
Africa:			
Algeria	9	9	5
Angola	1	1	
Egypt	4	3	2
Ethiopia			1
Madagascar	1	1	1
Mozambique		1	
French Equatorial Africa	3	3	2
French Morocco	9	9	5
Nigeria	6	4	1
Tunisia	6	8	6
Total	39	39	23
Middle East and Eastern Mediterranean:			
Bahrain	2	2	2
Greece	1	1	
Iran	1	1	2
Iraq	13	13	11
Israel	3	1	
Kuwait	3	3	4
Lebanon			
Neutral Zone	2	2	
Trucial Coast	1	1	1
Qatar	2	2	3
Saudi Arabia	7	7	9
Turkey	5	2	2
Total	40	35	34
Other Asia:			
Australia	7	4	2
Burma	2	2	2
Indonesia and British Borneo	46	42	41
India	6	6	4
New Caledonia	1	1	
Pakistan	5	5	5
Japan	15	15	13
New Guinea	4	4	5
Total	86	79	72
Grand Total	687	662	632

Peru Boosts Prices

Government eases controls as oil imports threatened

THE Peruvian Government has relaxed its rigid control over prices of petroleum products sold for internal consumption.

The action was taken as rising demand and a relatively constant production threaten to make it necessary to import oil into the country. About 70 per cent of the gasoline and virtually all the fuel oil produced in Peru are sold on the domestic market.

The two major producers, International Petroleum Co., Ltd., and Cia Petrolera Lobitos, in recent public announcements called attention to the necessity of fuel-oil imports. These imports must be bought at world market prices which are higher than the controlled domestic price. Without supplementary supply from imports, the Callao bulk terminal will soon exhaust its stocks.

Even with the recent government-authorized increases, Peruvian products prices are among the world's lowest. The new price for motor fuel is the equivalent of about 10 cents a gallon, including a consumption tax of 3½ cents a gallon. Kerosine, diesel oil, and fuel oil, all tax exempt, have fixed prices of 5, 5¼, and 4 cents respectively.

The decree authorizing the increases provides that in the future prices shall be revised semiannually on the basis of world market crude-oil prices and refining costs. Peruvian requirements are met mainly from International's 45,000-bbl. daily refinery at Talara, the only large refinery in Peru.

Desert Letdown

11 dry holes give Sechura area of Peru poor outlook

THREE companies have so far racked up 11 dry holes in the once highly regarded Sechura Desert of northwestern Peru.

One of the companies, Richmond Oil Co., has already suspended work, and if the present two wells now being drilled are failures, a further reduction in activity is likely.

The Sechura has been a major exploratory disappointment, although some geologists feel there is a chance that production may still be found in the area. All the 11 wells drilled to date went through the Tertiary and to their Cretaceous or basement objective without, as far as is known, a show of oil. Some of the wells tested dry gas, a commodity which has little value in this part of the world.

Union Oil Co. of California has drilled five dry holes in the Sechura and is now on its sixth well. This test, Huaca 1, was last reported below 3,900 ft. Reports are that Union will restudy its position if the Huaca well is also unsuccessful.

The other Sechura drilling well is the wildcat of International Petroleum Co., Ltd., on the Venturosa 10 block held by Sea Oil, Ltd., with which International has a concession-interest agreement. International has drilled four previous Sechura wells, including one other on Sea Oil acreage. International's Viru 5X1, abandoned at 8,060 ft., was the deepest to date in the Sechura. Richmond drilled two tests before suspending work. Richmond is a Standard Oil Co. of California subsidiary; International is affiliated with Standard Oil Co. (N. J.).

Texas Petroleum Co. (The Texas Co.) recently launched seismograph work on Sechura acreage which it acquired from Peruvian Oil Concessions and Cia. Sudamericana de Petroleo, representing Peruvian and Argentine interests.

Petrolera Peruana, which represents a Peruvian group headed by A. Gildermeister, expects to commence its first exploratory test in the near future.

Costa Rica Test Scheduled

Union Oil Co. of California is scheduled to spud the first well of a three-well exploratory drilling program in Costa Rica this month.

The initial test, Patino 1, is to be located in the southern part of Limon Province on the Atlantic side of the country not far from Puerto Viejo where Sinclair drilled an unsuccessful well several years ago.

The concession agreement provides for a 4-year exploratory period with the company committed to spend at least $200,000 the first 2 years and the same sum the second 2 years.

China Sea Wells to Produce

British Malayan Petroleum Co., Ltd. (Royal Dutch-Shell) plans to begin commercial production of four wells drilled from a platform a mile offshore from British Borneo in the South China Sea.

According to a report from Seria, crude will be moved through a submarine line and then delivered to the Lutong refinery where other production from Seria field is processed. Two more platforms are under construction about a mile from the shore and about a mile apart.

Europe's First Platformer Goes On Stream

The first Platformer completed in Europe is operating at the Hamburg, Germany, refinery of the German subsidiary of Anglo-Iranian Oil Co., Ltd., BP Benzin-und Petroleum-GmbH. The top of the Platformer is shown in the foreground along with a general view of a 12,000-bbl. per day Foster Wheeler atmospheric distillation unit, which also was recently completed. The 5,000-bbl. Platformer was dedicated on the fiftieth anniversary of the subsidiary. The Hamburg refinery has a daily capacity of about 25,000 bbl. The plant operates on Iraq and Kuwait crude. The refinery's yield is divided with 28 per cent going to motor gasoline, 23 per cent diesel fuel, 40 per cent fuel oil, 4 per cent asphalt, and 2 per cent L.P.G.

Petrochemical Processing

. . . a special Journal section devoted to today's techniques of petrochemical manufacturing.

- How ethylbenzene is made by two different processes.
- Taking the lab out into the plant . . . what infrared analysis does in ethylene processing.
- Atlantic's new ammonia plant—first use of by-product hydrogen from catalytic reforming.
- Evaluating a proposed process: partial oxidation with air at elevated pressures.

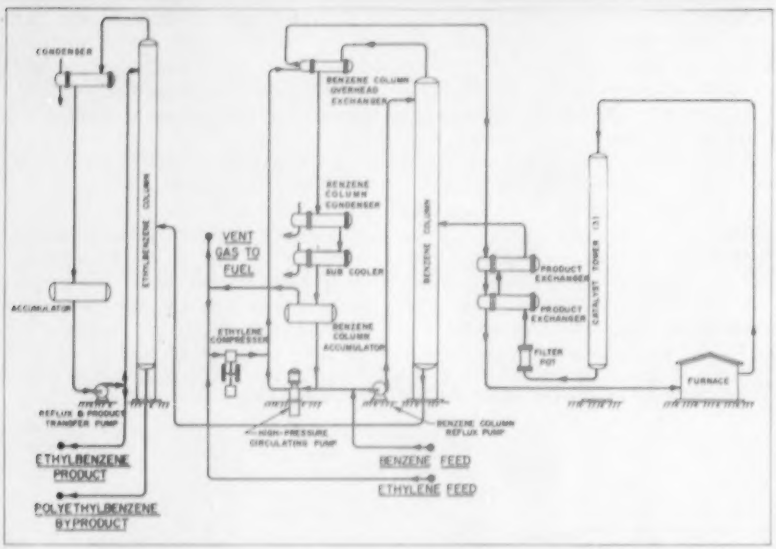
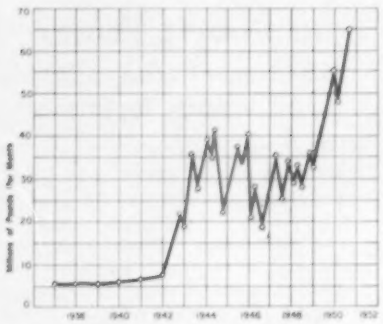


Fig. 1—High-pressure, high-temperature process for making ethylbenzene.



This chart shows the trend in styrene production to which virtually all ethylbenzene output goes. Besides its use in synthetic rubber, styrene consumption in synthetic resins increases steadily.

ETHYLENE—4

How Ethylbenzene Is Made

1 . . . by the high-pressure process

by F. R. Garner and R. L. Iverson

Ethylbenzene is produced by Koppers Co. at its Kobuta, Pa., plant by the high-pressure alkylation process, and at its Williams plant at Port Arthur, Tex., by the aluminum chloride process. Here's the story of how each process is carried out and its advantages.

ETHYLENE gas is mixed with excess benzene and forced at high-pressure and elevated temperature through three fixed-bed catalyst towers in parallel. Reaction between ethylene and benzene occurs as the mixture passes through the catalyst beds with an accompanying rise in temperature since the reaction is exothermic. The hot reactor effluent discharges into a distillation column operating at 45 psig. where the excess benzene is distilled overhead and returned to the system. The materials boiling higher than benzene are removed from the bottom of this column and serve as feed to a second column operating at atmospheric pressure. In this column ethylbenzene is separated and recovered overhead and the materials boiling higher than ethylbenzene are removed from the bottom as a byproduct.

Authors are associated with Koppers Co., Inc., Pittsburgh. Paper initially presented before the American Chemical Society.

Fixed bed . . . The high-pressure, high-temperature, fixed-bed catalyst process (Fig. 1) utilizes a silica-gel carrier on which alumina is deposited as the active agent. Liquid benzene circulates through this system at as high a rate of flow as practical, driven by high-pressure, multistage, vertical, centrifugal pump. Ethylene is injected into the benzene flow after the discharge from the high-pressure pump. This high flow of benzene containing ethylene passes through a series of heat exchangers in which heat is absorbed first from hot benzene vapors from the overhead of the benzene column and subsequently from the hot reactor effluent before passing through a gas-fired furnace where the feed receives its final preheat before entering the catalyst cases. Inlet conditions at the catalyst cases average 900 psig. and 310° C.

Fractionation . . . As the alkylation reaction proceeds through the catalyst chambers, a temperature rise occurs, the magnitude of which is determined by the throughput. The hot reactor effluent passes through two heat exchangers where it gives up heat to the incoming feed and then discharges into the benzene column. The feed to the benzene column in passing from approximately 850 psig. down to 45 psig. flashes and supplies a portion of the

heat necessary to fractionate benzene from the ethylbenzene and heavier. The overhead vapors from the benzene column pass first through a heat exchanger wherein the benzene and ethylene feed mixture are preheated. Then the vapors move through a condenser and subcooler into an accumulator from which the high-pressure circulating pump takes suction.

The bottoms from the first column, in which a minimum of benzene is maintained, pass by pressure difference into a second or ethylbenzene column. Here the bottom temperature is regulated along with the reflux ratio to maintain a minimum amount of higher alkylated benzenes (polyethylbenzene) in the column overhead and a minimum loss of ethylbenzene in the byproduct polyethylbenzene from the bottom. Both column reboilers are heated by 450-psig. steam.

Benzene column control . . . The benzene column is maintained at 45 psig. by a control valve on the column accumulator vent to the plant fuel-gas system. This vent stream consists of inerts in the ethylene stream plus small amounts of unreacted ethylene. A portion of this vent stream is diverted back to the gas holder feeding the ethylene compressors to maintain a constant percentage of inerts in the ethylene feed to the unit. This in turn maintains maximum utilization of ethylene and assures smooth pressure control on the unit.

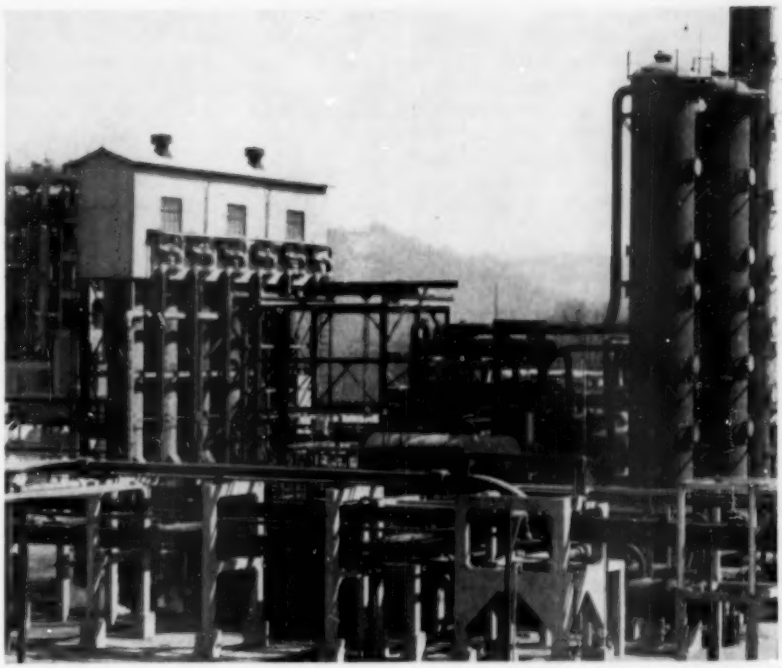
The ethylbenzene column operates under atmospheric pressure, and the make from the column, after passing through a product cooler, is pumped to storage. It is subsequently pumped to the ethylbenzene dehydrogenation unit as required.

Makeup benzene is supplied to the system at the common suction of the high-pressure benzene-circulating pump and the benzene-column reflux pump. The rate of fresh benzene makeup to the system is controlled by a level control on the benzene-column accumulator.

Ethylene feed rate to the system is controlled solely by manually varying the speeds of three reciprocating compressors feeding ethylene into the high-pressure recycle benzene stream. The benzene flow rate is maintained at a constant value and production rates are determined by the quantity of ethylene fed.

High-Pressure Process Factors

During the 11-year period that the Koppers Co. has produced ethylbenzene from its high-pressure alkylation facilities, the process has demonstrated that it is a thoroughly reliable commercial method of producing large quantities of this material. Its more than 120,000,000-lb. per year capacity produces ethylbenzene of extremely high purity, averaging over 99.9 per cent.



ETHYLBENZENE PLANT operated by Koppers Co. at Kobuta, Pa., employs fixed-bed, high-pressure alkylation process.

The accountability of the two raw materials, ethylene and benzene, is extremely good, since none is lost in the form of polymer or tar. Of the ethylene fed to the system, 98 per cent is present in the produced ethylbenzene and polyethylbenzenes. Of the benzene fed to the system, 98.5 per cent is realized.

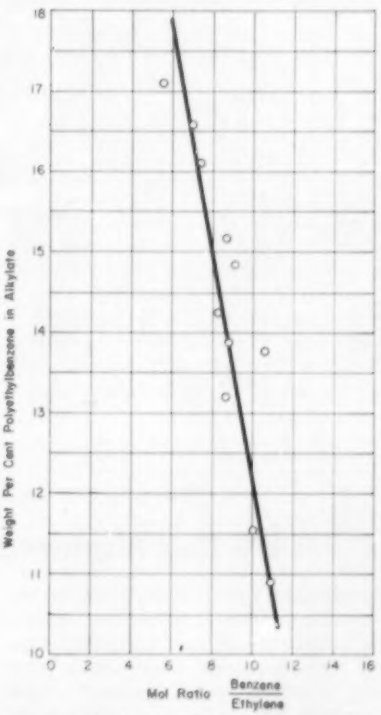


Fig. 2—Relation between benzene/ethylene mol ratio and per cent polyethylbenzene in alkylate.

Polyethylbenzene dealkylation . . . One feature of the high-pressure process is the considerable diversion of raw materials into products such as polyethylbenzene, a byproduct of the reaction between benzene and ethylene at high pressure and temperature. This production of higher-alkylated benzene does not represent a direct loss of raw material from the system since it can be used as a source of ethylene in alkylating additional benzene. This dealkylation of polyethylbenzene can be accomplished in a dealkylation unit, which because of the relatively small quantities involved, is a low-cost, package unit. An increasing portion of the polyethylbenzene produced is being separated into its constituents for further processing into specialty chemicals, having a good margin of profit.

The production of these higher-alkylated benzenes is influenced by the following factors:

1. Total alkylate production. With a fixed benzene circulation rate through the system, the total alkylate production is determined solely by the rate of ethylene injection assuming constant catalyst activity. As the rate of ethyl-

ene injection is increased to increase total alkylate production, the mole ratio of benzene to ethylene in the feed to the converters decreases correspondingly, thus increasing the percentage of polyethylbenzene in the alkylate. The relation between the polyethylbenzene produced and the mole ratio of benzene to ethylene used is shown on Fig. 2. In order to decrease the mole ratio of benzene to ethylene at high production rates, benzene circulation must therefore be increased.

2. Temperature level of conversion. As the activity of the catalyst decreases due to deposition of carbon on the silica-gel carrier, it is necessary to raise the inlet temperature to the converters to maintain the rate of alkylation. The unreacted ethylene in the converter effluent will increase and continue to do so unless the temperature level of conversion is increased to compensate for this decreased catalyst activity. Accompanying this increase in reaction temperature level is a corresponding increase in polyethylbenzene production.

Raw material quality . . . The output of the high-pressure process for producing ethylbenzene is a function of the quality of the two entering raw materials. Impurities in the benzene and ethylene feed streams decompose to carbon in the catalyst beds and thus restrict flow. They also break down to form mildly corrosive mixtures which result in damage to portions of the process system over a period of years.

Catalyst bed plugging . . . Starting with fresh catalyst at maximum benzene circulation rate and high ethylene feed rate, the pressure drop across the catalyst towers increases from an initial value of about 20 psi. to 180 psi. over a period of about 70 days. This is due to impurities in the incoming benzene and ethylene feed streams which, as the reaction proceeds, decompose to carbon and gradually block the free space in the bed. This gradual plugging of the catalyst bed takes place predominantly in the upper quarter of the catalyst chamber with downflow. As the pressure drop increases, it is necessary to lower the outlet pressure of the catalyst towers to avoid excessive pressure at the inlet. The limit of this action to compensate for pressure drop comes when the catalyst-chamber outlet pressure is so low that the percentage of alkylation drops off rapidly, usually at about 700 psig. Recent studies have shown promising methods of increasing the purity of the feed stock and thereby increasing the onstream time.

In order to partially compensate for this progressive plugging of the upper portion of the catalyst bed using downflow, the direction of flow through the chambers is reversed. As a result, the pluggage in the upper portion of the bed is loosened and partially washed out, and the catalyst life may be extended by about an additional 15 days. The final shutdown to replace catalyst usually results from a combination of high-pressure drop and excessive alkylation temperature.

Corrosion . . . Normally this process suffers little from corrosion problems if the incoming benzene is of good quality with sulfur content below 100 p.p.m. With poor quality nitration benzene, however, the high sulfur in the benzene will break down to form an excessive amount of H_2S in passing through the catalyst chambers. Along with the moisture entering with the fresh benzene and ethylene streams, the H_2S forms a mildly corrosive mixture in the low-pressure system which will result in shortened life for both lines and equipment. This difficulty is partially overcome by scrubbing the vent gas from the benzene-column accumulator with a dilute solution of caustic soda.

A certain amount of erosion occurs due to high liquid and vapor rates in the low and high-pressure systems. This is compensated for by using extra-heavy piping and by improved piping layout to eliminate points of excessive impingement.

The process has the distinct advantage of not being sensitive to the impurities mentioned above. While sulfur in the feed stock will eventually lead to replacement of piping, the high-pressure system (because of the high temperature) remains unaffected and the activity of the catalyst is not affected in any way.

Ethylene purity . . . Hydrocarbon impurities in the ethylene, except for acetylene and olefins, have no effect on efficiency or catalyst activity. Ethylene having a purity as low as 85 per cent can readily be used if the impurities are paraffins or hydrogen. Olefins produce benzene compounds corresponding to the olefin present. Acetylene decomposes to carbon with the results discussed previously.

Other advantages are: Neither the benzene nor the ethylene have to be dried before using since moisture has no effect on the catalyst; and there are no tars, liquors, or obnoxious wastes of any kind to dispose of, hence no effluent problems. Corrosion is a very minor problem.

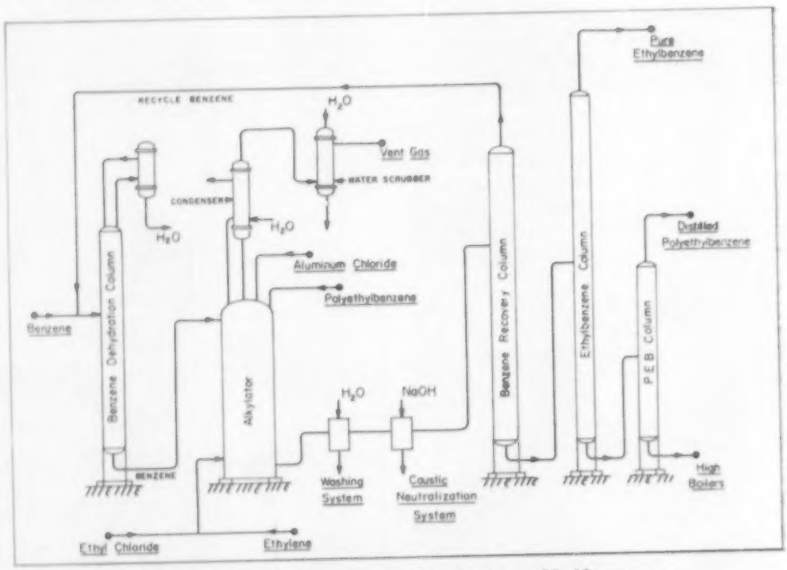


Fig. 3—Ethylbenzene flow diagram for aluminum chloride process.

2 . . . by the aluminum chloride process

THE newest plant in the chemical division of Koppers Co., Inc., utilizes the aluminum chloride catalyzed process for ethylbenzene manufacture. This unit is at the Williams plant, located near Port Arthur, Tex. Rated at 90,000,000 lb. per year capacity, the unit demonstrated a capacity of over 100,000,000 lb. per year in the first few months of operation.

The aluminum chloride catalyzed process for ethylbenzene manufacture has been described in the patent literature and in articles concerning commercial installations. The process employed at Koppers' new Williams plant em-

WILLIAMS PLANT of Koppers Co. at Port Arthur, Tex., manufactures ethylbenzene by the aluminum chloride process.

ploys principles similar to those used in several wartime plants.

A simplified flow diagram (Fig. 3) of the process shows the essential steps to be dehydration of benzene, reaction of benzene and ethylene in the alkylators, neutralization of the crude alkylate, and rectification of the alkylate components in several continuous-distillation columns.

Raw materials . . . As in the high-pressure alkylation method, basic raw materials for the aluminum chloride process are ethylene and benzene. Koppers' Williams plant obtains ethylene from the nearby Gulf unit at Port Arthur, Tex. Purity, although over 98 per cent as received, is not critical for this ethylbenzene process so long as the impurities are inerts such as hydrogen or paraffins. Compounds such as acetylene, propylene, sulfur and water are detrimental in that catalyst consumption is increased or troublesome compounds are produced which interfere with the ease of purification of the ethylbenzene.

Benzene is received at the Williams plant by barge and rail from producing plants in the Northeast and South. Nitration grade or industrial benzene are satisfactory raw materials. Sulfur compounds are deleterious to catalyst consumption, and paraffins accumulate in the recycle benzene stream, causing some operating difficulties.

In addition to these basic raw materials, anhydrous aluminum chloride is used as the catalyst, ethyl chloride is used as a promoter, and aqueous caustic soda is used for neutralization. This plant also utilizes as raw material the polyethylbenzenes produced in the high-pressure alkylation process. These polyethylbenzenes differ from those formed in the aluminum chloride alkylation process in concentrations of diethylbenzene, triethylbenzene, etc.

Chemistry of the Process

The alkylation of benzene with ethylene by the aluminum chloride catalyzed process differs from the high-pressure alkylation process in one important respect. This is in the reversible nature of the Freidel-Crafts reaction compared to the high-pressure, fixed-bed method. Use is made of this fact by utilizing polyethylbenzene to reform ethylbenzene.

The normal commercial reaction may be illustrated as:

$$\text{Benzene} + \text{ethylene} \xrightarrow[100^\circ\text{ C.}]{\text{Al Cl}_3 + \text{HCl}} \text{benzene} + \text{ethylbenzene} + \text{polyethylbenzene}$$

The recycling of the polyethylbenzenes so formed might be considered an application of the mass-action law to suppress the formation of additional polyethylbenzenes.

With the use of outside polyethylbenzenes as one raw material, a similar equation illustrates the formation of ethylbenzene:

$$\text{Polyethylbenzenes} + \text{benzene} \xrightarrow[100^\circ\text{ C.}]{\text{Al Cl}_3 + \text{HCl}} \text{benzene} + \text{ethylbenzene} + \text{polyethylbenzenes}$$

In each case the catalyst is anhydrous aluminum chloride with hydrogen chloride promoter. The promoter is conveniently supplied in the form of ethyl chloride which decomposes to ethylene and hydrogen chloride in the reaction zone. The mechanism of catalyst activity is not well understood, but involves the formation of an aluminum chloride hydrocarbon complex. This complex is a dark oil of heavy gravity with low solubility in the reacting hydrocarbons. It contains about 20 to 30 per cent water-soluble salts with the hydrocarbon balance similar in composition to the alkylate mother liquor except for a higher concentration of high-molecular-weight hydrocarbons.

Ethylene/benzene ratio . . . As expected, when the ratio of ethylene to benzene is increased, the concentrations of ethylbenzene and polyethylbenzenes in the reaction product increase while benzene content decreases. To a certain degree this is desirable in that the quantity of recycle benzene is reduced. However, the over-all efficiency is reduced due to the formation of high-molecular-weight hydrocarbons which are not recycled and also due to the possibility of incomplete reaction of the ethylene. In plant practice it is normal to maintain a benzene to ethylene molal ratio between about 1.5 to 1 and 2.5 to 1 so that the resulting alkylate contains approximately 35 to 55 weight per cent benzene, 30 to 50 per cent ethylbenzene, and 5 to 15 per cent polyethylbenzenes.

In order to maintain the desired molal feed ratio when feeding polyethylbenzenes, it is necessary to know the benzene and ethylene contents. This can be determined in either of two ways. By analysis of the polyethylbenzenes and application of the theoretical benzene and ethylene contents of the constituents, a value is obtained which exceeds that attained in plant practice. In the other method, laboratory exhaustive dealkylation results are used to calculate available ethylene and benzene. This method, although more time-consuming, gives results closer to actual plant experience.

Impurities in the polyethylbenzenes such as secondary butyl benzene apparently undergo no change when exposed to normal alkylating conditions so cannot be considered to contain available benzene.

Alkylation

The reaction of ethylene with benzene is brought about in vessels called alkylators. In the aluminum chloride process, these alkylators are of corro-

sion-resistant construction although feed materials are kept anhydrous. Numerous modifications in design of the alkylators have been described. In the Williams plant alkylators, benzene, polyethylbenzene, and aluminum chloride flow countercurrent to the ethylene and ethyl chloride.

Exothermic . . . Heat is provided by the exothermic reaction of ethylene with benzene, the temperature being controlled near 100° C. by condensation of benzene vapors in an overhead vent cooler. A minor pressure of 2 to 8 psig. is maintained on the top of the alkylators, mainly to insure against introduction of moist air.

Some agitation is provided by the introduction of gaseous ethylene and ethyl chloride into a sparger line at the bottom of the reactor. With very pure ethylene, natural gas may be introduced to increase agitation.

Residence time . . . The reaction of ethylene is quite rapid and complete. However, total liquid residence time in the alkylators is of the order of 3 to 5 hours to permit reaching the equilibrium as shown in the paragraphs above subtitled, "Chemistry of the Process." Some of the catalyst complex concentrates in a zone near the bottom of the alkylator. After reaching an equilibrium state of complex distribution, the additional complex formed is entrained in reactor effluent.

Vent gases, consisting of paraffins from the ethylene feed gas and an insignificant amount of ethylene, leave the top of the alkylator where condensables are separated and returned to the alkylator. The vent gas is then scrubbed with water to remove hydrogen chloride after which it enters the fuel-gas system.

Neutralization of Alkylate

The reactor effluent is cooled first in cascade type, parallel-flow glass coolers. Then the alkylate flows to a catalyst-complex settling tank which serves to maintain an inventory of complex for possible use in startups, loss of reaction, etc. From here the reactor product is pumped to the neutralization system. This consists first of a water wash in an eductor followed by an agitated mixing tank. After water washing, the alkylate is further neutralized by a similar system of washing with aqueous caustic of about 5 to 20 per cent concentration.

Variations of this technique are in commercial practice with equally successful results. The important criteria of satisfactory neutralization are the absence of acids or caustic in the alkylate fed to the stills, and a low level of oil content in the aqueous effluent.

Distillation

The neutralized alkylate is fed from storage tanks to a series of continuous-distillation columns for separation of the components. In the first column, benzene is recovered for recycle. This column is of bubble-cap design and is operated at atmospheric pressure. Heat for the vertical-type thermosyphon reboiler is supplied by 165-lb. saturated steam.

Dehydration . . . The recovered benzene together with fresh benzene feed is dried in a small dehydration column. In this column the benzene-water constant-boiling mixture is taken overhead where the water is withdrawn. Bottoms for this column contains less than about 50 p.p.m. of water and represent benzene feed to the alkylators.

Considering again the flow of neutralized alkylate, the bottoms from the benzene recovery column serve as feed for the ethylbenzene column. Thus control of benzene content in the ethylbenzene product is attained through close control of the benzene-recovery-column base temperature. In the ethylbenzene column, the critical separation is between ethylbenzene and diethylbenzene. Impurities boiling between these compounds such as cumene and secondary-butyl benzene increases the difficulty. Although the normal boiling points of ethylbenzene and the diethylbenzene isomers are over 40° C. apart, the limit of 0.02 per cent maximum diethylbenzene content is rather restrictive. To accomplish the separation, a bubble-cap column is employed at atmospheric pressure. Ethylbenzene product purity averages over 99 per cent.

Separating polyethylbenzenes . . . The bottoms from the ethylbenzene column flow as feed to the polyethylbenzene stripping column. The purpose of this column is to separate the di and triethylbenzenes from higher-molecular-weight hydrocarbons which contribute nothing if recycled. This column operates at about 50 mm. absolute pressure. The di and triethylbenzene distillate can be returned in its dry condition to the alkylators if the secondary butyl benzene content is satisfactory. Since this component is essentially inert in the alkylators, its concentration is increased by recycling.

Because the boiling point of secondary butyl benzene is within 5° C. of diethylbenzene, it presents a difficult separation problem. Rectification in the new polyethylbenzenes is not feasible because of its low concentration. It has been found that best control is exercised by batch distillation of the polyethylbenzene-still distillate when the secondary butyl benzene content exceeds about 10 per cent. This batch distillation is conducted in a utility still. This same still is available for further distillation of the polyethylbenzene-still bottoms is desired and for redistillation of secondary butyl benzene, etc.

Process Control

Some of the prime control points in the aluminum chloride alkylation process may be described to help clarify the effect of some variables. Moisture content of the benzene, polyethylbenzene, and ethylene feeds to the alkylators should be maintained as low as possible. Besides reducing catalyst consumption, this helps minimize corrosion and sludge formation. Paraffins in the recycle benzene must be watched for diluent effect on ethylbenzene-production capacity and for interference in the benzene-dehydration column.

Due to the continuous nature of most operations and the thorough instrumentation, it has been possible to operate the Williams plant ethylbenzene unit including auxiliary water treating, boiler and hot-oil heating systems with three operating personnel per shift under the supervision of a shift foreman.

Efficiencies

In preliminary operations at the Williams plant, it has been shown that efficiencies exceeding 95 per cent can be realized on both ethylene and benzene. Aluminum chloride usage is in the order of 1 lb. per 100 lb. of ethylbenzene produced. Ethyl chloride and caustic soda are about half of this consumption.

Comparison of the Two Processes

Some advantages and disadvantages of the aluminum chloride process as compared to high-pressure alkylation are summarized in Table 1.

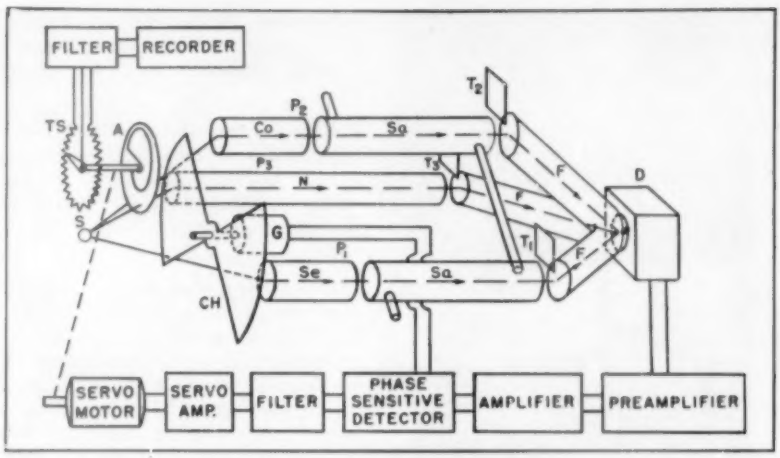
TABLE 1
Aluminum Chloride Process vs. High-Pressure Process Ethylbenzene Manufacture

Advantages

1. Dealkylation occurs.
2. No secondary butyl benzene formed.
3. Lower benzene to ethylene ratio possible.
4. No pressure equipment needed.
5. Greater flexibility in feed ratios possible.

Disadvantages

1. Corrosive conditions demanding resistant construction.
2. Higher catalyst consumption.
3. Possible neutralization difficulties such as emulsion formation.
4. Possible effluent problems due to acid and oil contact.
5. Reaction extremely sensitive to water.



IN THIS SCHEMATIC of a Tri-Non analyzer: S is source; CH is radiation chopper; P_1, P_2, P_3 are radiation paths; T_1, T_2, T_3 are optical trimmers; Se is sensitizer cell; Co is compensation cell; Sa are sample cells; N is nulling tube; F is filter cell; D is radiation detector; A is radiation attenuator; TS is transmitting slidewire; and G is reference generator. Fig. 1.

ETHYLENE—5

Continuous Analysis Via Infrared

. . . how it's used to maintain high ethylene purity

by Paul A. Wilks, Jr.

ONE of the major problems involved in ethylene processing is that of adequate analytical control. This is particularly true in the case of high-purity ethylene for polyethylene production.

What may be termed "secondary" or environmental controllers for measuring and regulating such variables as flow, temperature, and pressure have attained a high degree of development. More recently a trend has developed toward application of end-point analyzers.

Continuous analysis of various process streams and use of the information so obtained to adjust the environmental controllers is of extreme importance in a process such as the manufacture of ethylene. The time lag involved in transporting samples to the laboratory, analyzing them, and sending data back to the control room is avoided by the application, in the plant, of such analytical instruments as infrared and mass spectrometers.

These new instruments, based on the same principles as the laboratory analytical instruments, provide a continuous record. In effect, they move the laboratory out into the plant. Use of analytical recorders in the plant brings nearer the future employment, on a large scale, of analytical plant controllers.

Author is with Perkin-Elmer Corp., Norwalk, Conn.

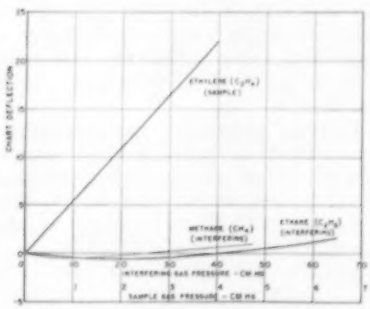
Nondispersive Infrared Analyzer

An infrared analyzer which is used to good advantage in ethylene processing is the Tri-Non (trademark of Perkin-Elmer Corp.). This is a nondispersive instrument designed to monitor continuously the concentration of a single component in a multicomponent gas stream. In this particular instrument there are three channels of radiation between source and detector. It is this feature of a third beam which permits operation at a continuous true-radiation null.

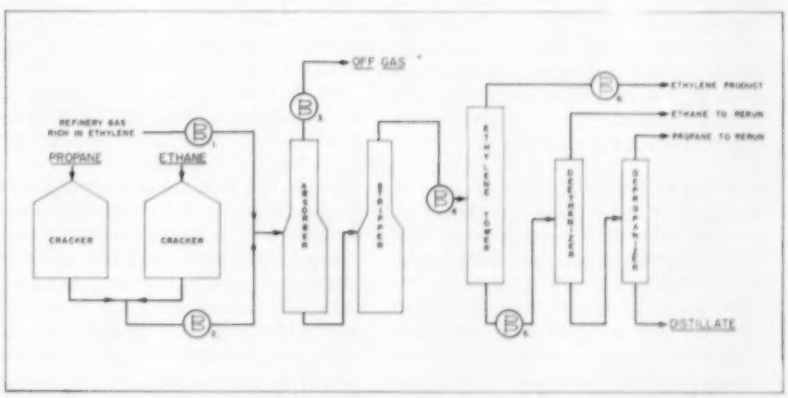
The concentration of the component being measured, such as ethylene, is translated into shaft rotation. A potentiometer is used to measure the amount of this rotation. Changes in characteristics of the electronic components have no effect on instrument accuracy. Effect of changes in infrared radiation source are minimized. Future installation of a pneumatic control mechanism may be made so that the instrument may be used as a direct controller. Transmission of information from the analyzer unit in the plant to the recorder mounted on a panel board is made electrically.

Operating principle . . . The Tri-Non is based on the same principle as the infrared spectrometer; i.e., that a chemical compound when irradiated with infrared rays will absorb radiation at a characteristic series of wave lengths.

As shown in the schematic Fig. 1, infrared radiation from the source S is transmitted through the three channels



ANALYTICAL SENSITIVITY of the analyzer for determining ethylene in the presence of methane and ethane. Sensitizing cell, 25 cm. C_2H_4; compensating cell, 79 cm. C_3H_8; filter cell, 16 cm. CH_4, 61 cm. C_2H_6. Fig. 2.



SIMPLIFIED FLOW DIAGRAM for ethylene processing. Symbols indicate possible points where continuous analyzers might be installed: 1, on charge gas, ethylene analysis; 2, on cracker product, 1 and 2 equals total ethylene to absorber; 3, absorber off gas, ethylene loss; 4, stripper overhead, total ethylene to tower; 5, ethylene tower bottoms, ethylene loss; 6, product analysis, ethylene purity. Fig. 3.

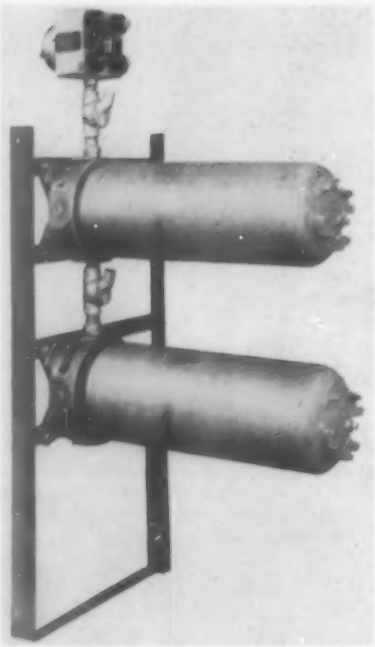
of radiation P_1, P_2, and P_3 to the selective detector D. The detector is usually filled with the gas whose concentration is to be recorded. Radiation is absorbed by the gas at the characteristic wave lengths. The gas is heated and causes deflection of a flexible diaphragm which is one side of a condenser. Change in condenser capacity with deflection results in an electrical signal. This signal is therefore a measure of the radiation incident on detector D and varies with the concentration of the component in sample cell Sa.

The mechanical chopper CH is arranged so that D receives alternately the radiation through channel P_2, then the sum of radiations through channels P_1 and P_3. The null point is obtained when these two radiations are of equal intensity and there is no alternating output from the detector D. The fillings of cells Se, Co, and F are adjusted as dictated by the particular application.

How it would work . . . Suppose we want to analyze for ethylene in a sample of a stream that also contains methane and ethane. Se and D are filled with ethylene. The trimmer T_3 is adjusted in path P_3 to make the sum of radiant power in P_1 and P_3 equal to that in P_2. There will now be equivalent heating on each cycle as radiation is chopped, and therefore no motion of the condenser diaphragm so that the instrument is at the null point.

When the stream sample flows through cell Sa, the radiation at the characteristic absorption wave lengths of ethylene in the path P_1 will be eliminated due to presence of ethylene in cell Se. Presence of ethylene in the stream sample will produce a greater cooling effect on the radiation in path P_2 than on that in P_1. An a.c. signal is produced as the result of the alternate heating. This a.c. signal is used to move radiation attenuator in path P_3 till a new balance point or null position is obtained. Meanwhile, the motion of the attenuator has been recorded by means of the potentiometer.

Sensitizing . . . Continuing with our example of the continuous analysis of an ethylene in a three-component stream, the problem of interference from ethane and methane is now encountered; i.e., these have absorption wave lengths in common with ethylene. In such cases of spectral overlap, compensation is obtained by filling filter cells F and compensating cells Co so that these are at such partial pressures of methane and ethane as to make the instrument sensitive only to variations in ethylene concentration in the stream. Analytical sensitivity and selectivity for determination of ethylene in the presence of methane and ethane is shown in Fig. 2.



INFRARED ANALYZER as installed alongside the process stream. Not shown is the sampling system or recorder. Recorder is normally located on control panel.

The subject of sensitizing a nondispersive infrared analyzer is discussed in detail by Woodhull, Siegler, and Sobcov.[1]

Infrared Analyzer in Ethylene Processing

Product purity is of prime importance in ethylene processing. The major impurities encountered are ethane and methane. The usual requirement is to measure the sum of these materials in the range of 0.0 to 0.5 per cent. The infrared analyzer can be used for this purpose.

In practice, the analyzer is adjusted to respond equally to ethane and methane and the recorder scale calibrated from 99.5 to 100 per cent ethylene. In this instance the sensitivity is such that a change of 1 per cent of scale (50 p.p.m.) is easily detected.

More difficult analyses require the measurement of individual impurities at points in the purification process where each impurity is being removed. These analyzers have been adjusted to measure in the range of 0 to 0.2 per cent of either ethane or methane, and in the range of 0 to 200 p.p.m. of acetylene. As for the first example, sensitivity is 1 per cent of scale, which means that a change as small at 2 p.p.m. can be detected in particular cases.

There are many other points where information concerning concentration of ethylene or other components is needed. Consider the following examples:

Feed stock analysis . . . Here the information is valuable both for process control and for accounting purposes when the feed stock is refinery gas purchased on the basis of its ethylene content.

Efficiency of process units . . . The performance of various units in the purification process can be monitored continuously. For instance, ethylene determinations may be made on the cracking furnace effluent, on the absorber, stripper, fractionating units, etc. (Fig. 3). The infrared analyzers are usually mounted alongside the process stream with electric transmission to the recorder which may be several hundred feet away. Often a single analyzer with a stream-switching sampling system and a multiple-point recorder can be used for several sampling points.

In other processes where ethylene is used as a raw material, similar analyses may be performed on ethylene as well as other components in the process stream.

Hazardous-condition warning . . . Infrared analyzers can also be extremely valuable when used to warn of a hazardous condition developing either in the stream or in the plant atmosphere. Visible or audible warning devices are usually operated by the output of the analyzer.

Continuous analyzers must, of course, meet the same requirements that have been established for environmental controllers. They must operate for months on end insensitive to vibration and shock, under ambient temperature conditions which may range from —10° to well over 100° F., and they must not create an explosion hazard. In addition, they should be readily serviceable. In the case of the Tri-Non this has been made as simple as possible by means of built-in test circuits that permit on-stream testing, and unitized, easily removable electronic circuits that make quick on-the-spot repairs a simple matter.

Continuous-process stream analyzers are already in service in ethylene processing plants to insure effective analytical control. The information they provide permits the "closing of the loop" between the product of the processing plant and the environment in which it is produced.

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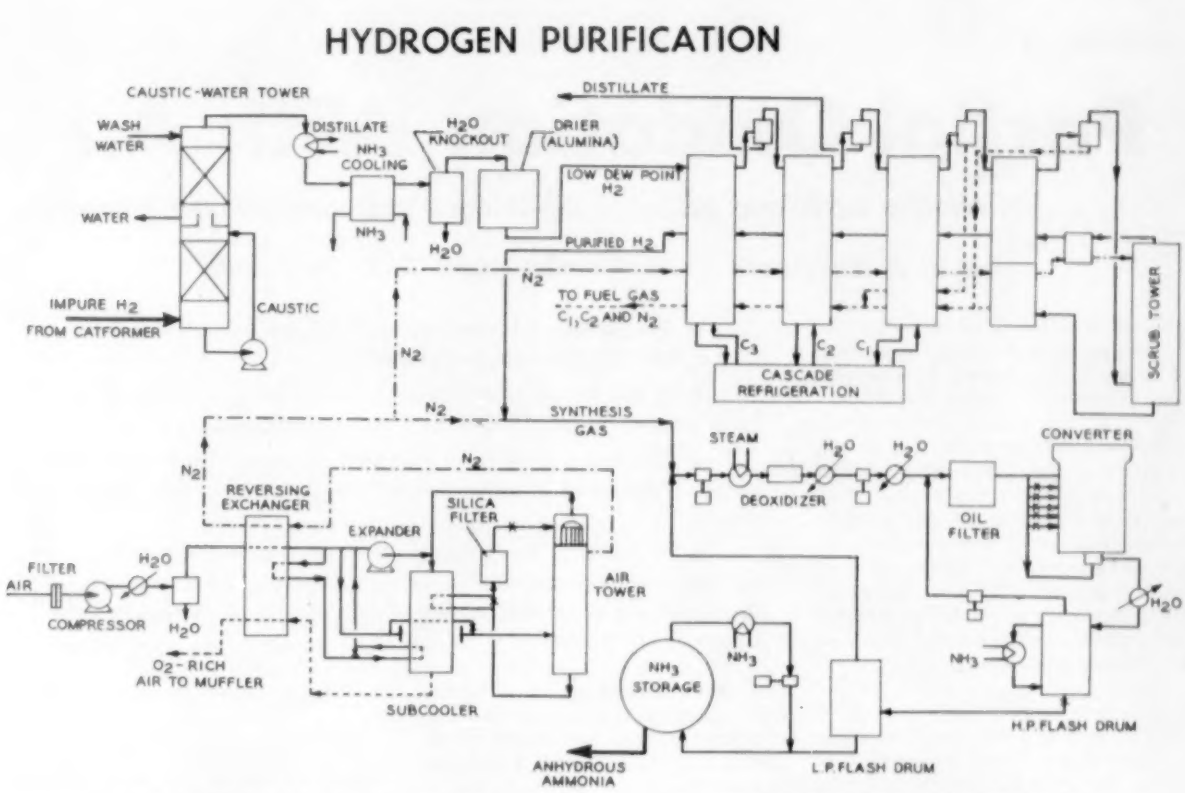

AMMONIA—4

How Atlantic Purifies Catformer Hydrogen

ATLANTIC REFINING CO.'s new ammonia plant, which began operation in late July of this year, is the first to utilize hydrogen tail gas from a catalytic reformer for making ammonia.

Plant design is for some 100 tons per day of anhydrous ammonia with hydrogen furnished by Atlantic's 14,000-bbl. per day Catformer at its Philadelphia refinery. Some 60 per cent of the ammonia production has been allocated for industrial uses (i.e. to manufacturers of chemical products), and the remainder is marketed for utilization as fertilizer.

Excess hydrogen . . . With so many catalytic reformers now in operation or under consideration, much interest has been generated among refiners as to possible uses of the excess hydrogen.

Where the hydrogen comes from . . . Both dehydrogenation and hydrocracking are among the reactions taking place in catalytic reforming such as Atlantic's Catforming process. Hydrogen is produced in the dehydrogenation reactions but is consumed in hydrocracking. In practice hydrogen is recycled at a rate which will minimize coke laydown while permitting desired conversion of naphthenes to aromatics. The net result is an excess of hydrogen.

How much hydrogen? . . . Taking an average production rate of 500 cu. ft. of hydrogen per barrel of catalytic reformer feed, present production in this country approaches 200 million cubic feet. Reforming facilities now contracted[1] will swell this volume to a half billion cubic feet per day.

How hydrogen is purified . . . A brief account of Atlantic's processing has been given previously[2] but is summarized here for the reader's convenience in following the simplified flow sheet. The Catformer tail gas is between 90 and 95 per cent hydrogen and enters the purification section at 400 psig. Purification may be divided into two main steps. In the first, H_2S is removed by washing with caustic, and this is followed by a water wash. Next the gas is cooled (NH_3 refrigeration) to knock out water, and passes through alumina drying. In the second principal step of purification, the low-dew-point hydrogen stream goes through cascade refrigeration and the light hydrocarbons (C_1 through C_4) are removed in stages. Final step in purification is a liquid nitrogen wash at around —300° F.

Synthesis . . . The purified hydrogen (with some nitrogen from the nitrogen scrubbing tower) is combined with more nitrogen from the air plant to make synthesis gas. The gas is compressed in two stages (first-stage discharge is at 1,250 psig.) and goes through Cu-Ni catalyst in the deoxidizer to remove O_2 traces. Atlantic's synthesis is designed to operate at relatively low pressures, in the range between 2,200 and 3,850 psig., depending on catalyst activity and other factors, and temperatures between 900 and 1,000° F. Storage is in two spherical tanks holding a total of 15 days' production.

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1. The Oil and Gas Journal, August 9, 1954, page 62.
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Partial Oxidation With Air

. . . its relative costs and potential advantages over conventional processes

by B. J. Mayland, E. M. Comley, and J. C. Reynolds

- Preparation of ammonia synthesis gas accounts for a large part of the cost of ammonia manufacture.
- A number of modifications of synthesis-gas manufacturing have been considered. One of these is partial oxidation with air.
- This has not yet been operated commercially, but an evaluation is desirable to determine the feasibility of further development.
- Those who have available byproduct hydrogen from a cat reformer, ethylene unit or other source might wish to consider the possibility of partial oxidation with air in conjunction with the byproduct hydrogen.

IN the manufacture of ammonia synthesis gas from natural gas some form of primary and secondary reforming with steam over a catalyst may be considered as the conventional process.[1] Three modifications of this are: (1) the operation of the conventional process at elevated pressures, (2) elimination of the primary furnace by partial combustion with air at low pressure, and (3) partial combusion with air at elevvated pressures. These modifications are compared here with the conventional process on the basis of total cost of ammonia production.

Basis

As a starting point, the production of 120 tons per day of anhydrous ammonia was chosen since this is a size frequently encountered. The utilities and equipment for the synthesis loop were then taken as essentially constant among the various cases. Since the purity of the synthesis gas varies with the scheme of preparation and purification, the quantity of gas fed to the synthesis loop varies. The 350-atm. ammonia synthesis process[2] was considered more suitable for this evaluation than the 1,000-atm. process[3] because the synthesis-gas purities are rather high and some of the advantages of the 1,000-atm. process are lost when using high-purity synthesis gas.

Authors are with Girdler Corp., Louisville.

Four cases . . . These include the base case with conventional primary and secondary reforming and the three with the proposed improvements. The essential differences are shown in Table 1.

Process designs were prepared for these four cases in order to obtain equipment lists for cost-estimating purposes and utility requirements. The flow diagrams are shown in Figs. 1 and 2.

The Process Steps

Primary reforming . . . This operation has been used in many installations in the United States for the preparation of synthesis gas from natural gas.[1,4] In the primary furnace, part of the natural gas is reacted with steam over a catalyst to form hydrogen and carbon monoxide with some carbon dioxide byproduct. This reaction is very endothermic so that considerable heat-transfer area is required. Since the temperature levels are above 1,400° F., alloy is required and the equipment is expensive. In the conventional process the pressure level in the primary is usually limited to 20-30 psig. but may go as high as 45 psig.

Pressure operation . . . As part of a pilot-plant program reforming data were obtained at 150 psig. Because of the high temperature levels and the low allowable fiber stress, small-diameter tubes with relatively thick walls are necessary. In primary reforming allowable space velocities correlate closely with the heat-transfer area. The data indicate that little advantage is obtained by pressure operation with respect to heat-transfer coefficients or reaction rates. However, pressure operation does allow the use of higher space velocities in the smaller-diameter tubes without excessive pressure drop while maintaining the same bed depth.

Secondary reforming . . . In this step as practiced additional natural gas is burned with air which supplies the nitrogen.[4] These combustion prod-

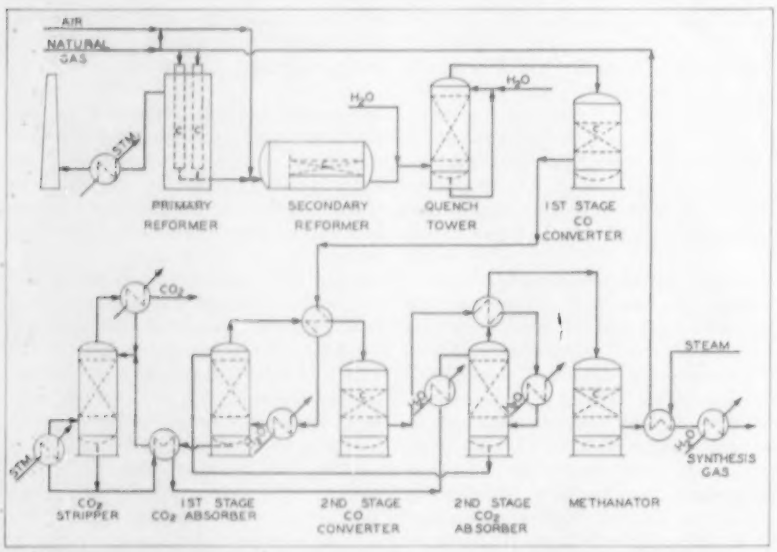

Fig. 1—Ammonia synthesis gas preparation and purification, Case 1, conventional primary and secondary reforming. A similar flow diagram holds true for Case 2.

ucts along with the effluent from the primary furnace pass through a large catalyst bed. Since the net reaction is exothermic no heat exchange is necessary and the process can be carried out in an adiabatic reactor. By a heat balance, the natural-gas split between the primary and secondary and the temperature boost through the secondary are readily ascertained. A typical figure is 75 per cent of the natural gas to the primary and 25 per cent to the secondary, resulting in a 100° to 200° F. temperature rise across the secondary. Since heat-transfer surface is unnecessary, the unit can be readily designed for operation under moderate pressure.

Air partial oxidation . . . This step used in Cases 3 and 4 has received some attention by various investigators in the past but has not been commercially developed to our knowledge.[5] Kinetic considerations[6] indicate the process is somewhat more complicated than the oxygen-natural gas partial-combustion process. Because of the nitrogen dilution, temperature levels attained are not high enough for thermal equilibration without excessive preheat, and therefore, a catalyst is required.

Air and natural gas are burned with approximately 50-60 per cent aeration for complete combustion. Additional natural gas along with diluent steam are combined with the initial combustion products and the mixture passed over a reforming catalyst. In the design of the reactor in Case 3 in which the process is operated at atmospheric pressure, conditions can be set up to closely resemble those encountered in commercially operated secondary reformers. Case 4 involves the additional factors introduced by pressure operation.

Carbon monoxide conversion . . . In this step carbon monoxide is reacted with steam to give hydrogen and carbon dioxide.[1] The reaction is mildly exothermic and operates at temperature levels around 700° to 850° F. with an iron oxide-type catalyst. There has been considerable commercial experience with this process at near atmospheric pressure. There is at least one plant in the United States operating at elevated pressures. Pressure operation allows a higher space velocity for a given conversion and temperature level or with the same space velocity a lower temperature level can be used.

Carbon dioxide removal . . . This is accomplished in each case by a Girbotol regenerative absorption system employing aqueous monoethanolamine solutions.[7] Under pressure operation, it is possible to recover heat in the amine stripper reboiler by condensation of steam from the process stream. This results in a somewhat better fuel economy than other methods of heat recovery.

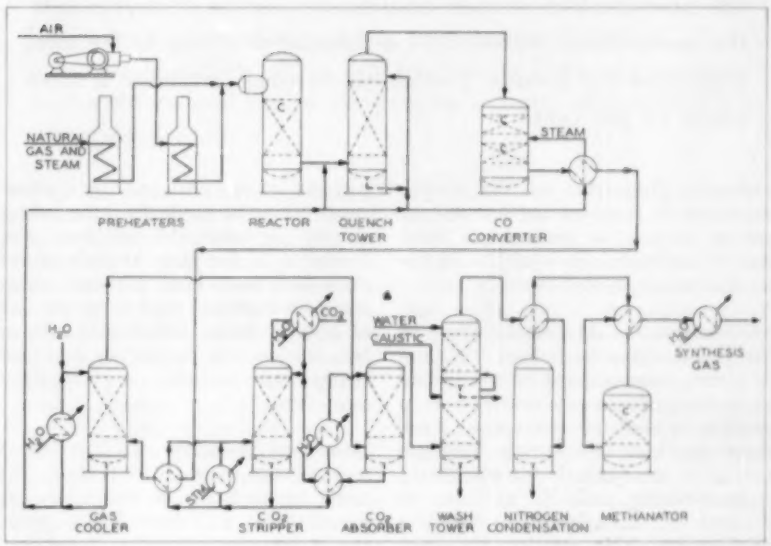

Fig. 2—Partial oxidation with air, Case. 4. A similar flow diagram can be applied to Case 3.

Low-temperature nitrogen separation . . . In Cases 3 and 4, the gas resulting from the air-steam-natural gas reactions contains an excess of nitrogen. This gas is ideal for mixing with a pure hydrogen stream to give a 3/1 ammonia synthesis gas.[8] However, lacking a hydrogen stream, the excess nitrogen can be removed by low-temperature condensation.[9] In this step the hydrogen-nitrogen mixture at 266 psig. and 100° F. is freed of carbon dioxide by caustic wash and dried, and then subjected to heat exchange resulting in partial condensation. Refrigeration is obtained by flashing the liquefied excess nitrogen at an intermediate pressure and then lowering the pressure to atmospheric through an expander and heat exchangers. Impurities, such as methane and argon, are removed with the excess

TABLE 1—SUMMARY OF FLOW SCHEMES EMPLOYED TO PREPARE AND PURIFY AMMONIA SYNTHESIS GAS

	Primary and secondary reforming		Air partial oxidation	
Case—	Conventional 1	Elevated press. 2	Low pressure 3	Elevated press. 4
Inlet pressure, psig.	45	150	45	350
Preparation step	Primary and secondary reforming	Primary and secondary reforming	Air partial oxidation	Air partial oxidation
Purification step (a)	CO conversion	CO conversion	CO conversion	CO conversion
Purification step (b)	CO_2 absorption	CO_2 absorption	CO_2 absorption	CO_2 absorption
Purification step (c)	CO conversion	CO conversion	Compression to 266 psig.	Nitrogen condensation
Purification step (d)	CO_2 absorption	CO_2 absorption	Nitrogen condensation	Methanation
Purification step (e)	Methanation	Methanation	Methanation	
Compressor suction, psig.	9	105	234	234
Per cent inerts in synthesis gas	1.30	1.30	0.34	0.34
S.c.f. of synthesis gas per ton NH_3	99,750	99,750	91,600	91,600
Per cent conversion of useful gas	90.4	90.4	97.5	97.5

"Air partial oxidation at elevated pressure has an advantage over the conventional process . . . a substantial saving in the total production cost is made. Further, the required investment is down about 12 per cent."

nitrogen. Only part of the carbon monoxide is removed so that the resulting gas must be methanated. Some loss of hydrogen by solubility in the liquid nitrogen is encountered.

Methanation . . . As a final cleanup of the gas, methanation is used.[10] Traces of carbon monoxide and carbon dioxide as well as oxygen are reacted over a catalyst to methane and water. Since these reactions all consume hydrogen and dilute the synthesis gas with inerts, it is obviously desirable to limit the amount of material that must be methanated. This reaction has been carried out at atmospheric or elevated pressures with no difficulties.

Economic Evaluation

From the process designs of the gas-preparation and purification units, equipment lists of the major items were prepared and cost estimated. The estimates did not need to be of a high degree of accuracy since only comparisons were desired. A great deal of effort was exerted, however, to insure that the costs of the major items of equipment were on a comparable basis.

Conditions . . . Piping and structural steel were taken as 25 per cent and 3 per cent, respectively, of the major equipment. Other construction items, such as electrical, insulation, painting, etc., as well as freight were set at the same value in all cases. A 5 per cent contingency was then added, allowing for items which already contained the manufacturer's contingency.

The cost of erection was taken as 35 per cent of the total and again allowance had to be made for items which already included the erection cost. Estimates of the other sections of the plant were based upon previous studies and were evaluated on a dollar per unit of capacity basis. Other costs such as fees, engineering, purchasing, and field charges were included as plant-investment items.

Investment summary . . . The investment figures are given in Table 2. The totals for each of the four cases are complete for a "battery limits" plant, except for storage facilities. Land cost, site preparation, and installations outside the battery limits such as administrative and employe-welfare installations are not included in these estimates. Each item in the tabulated investment is comparable among the cases. For example, in each case the preparation and purification section delivers the required amount of synthesis gas at the same pressure and temperature. The pressure chosen was 234 psig. and in Cases 1 and 2 some of the compression investment was added to the preparation and purification section.

The utility requirements are obtained from the process calculations. These are given in Table 3. Steam is expressed as a separate item. However, it is customary to express it as equivalent fuel-gas requirement and this is done in arriving at the final cost figures.

Ammonia cost . . . The manufacturing cost per ton of ammonia is used for the final comparison of the processes.

TABLE 2—INVESTMENT
(120 Tons per Day Anhydrous Ammonia Production)

	1	2	3	4
Preparation and purification	$2,015,200	$2,215,000	$1,922,600	$1,527,170
Compressor section	562,430	562,430	515,450	515,450
Ammonia synthesis section	1,158,780	1,158,780	1,158,780	1,158,780
Cooling towers	87,930	86,720	87,930	61,170
Compressor building	241,290	187,940	289,310	241,290
Total	$4,065,630	$4,210,870	$3,974,070	$3,503,860

TABLE 3—SUMMARY OF UTILITIES
(120 Tons per Day Anhydrous Ammonia Production—Quantities per Ton)

	1	2	3	4
Natural gas, M.s.c.f.:				
Process	22.3	22.3	24.8	26.6
Fuel	11.2	13.5	3.0	3.6
Purge credit	—2.0	—2.0	—0.5	—0.5
Total	31.5	33.8	27.3	29.7
Steam, M. lb.	9.6	8.3	10.4	3.5
Cooling water, M. gal.	79.4	77.0	79.4	55.4
Electric power, kw.-hr.	858	676	1,052	887

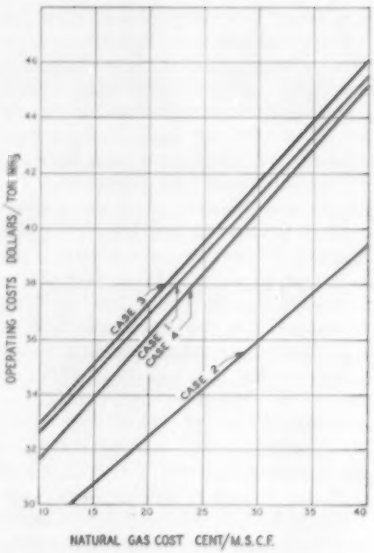

Fig. 3—Comparative costs of ammonia processes vs. the cost of natural gas.

The plant investment affects directly the cost of producing ammonia. Fixed costs and maintenance are expressed as a percentage of the total plant investment. Other costs included are those for natural gas, cooling water, electric power, steam as equivalent natural gas, catalyst, chemicals, operating labor and overhead, supervision and control, and operating supplies. The cost per ton of ammonia depends upon the plant location. In this study the cost schedule is based upon a south-central location and is shown in Table 4. Using these values and the process requirements from Table 3, the cost per ton of ammonia is obtained, Table 5.

Elevated Pressure Partial Oxidation Cheaper

Operation of the conventional primary and secondary reformer at elevated pressures results in some improvement as shown by Cases 1 and 2. The improvement is not large for the particular price structure chosen. Because of the greater number of smaller tubes with thicker walls, the investment in the primary furnace is increased appreciably. A saving in compressor investment offsets only part of this. The resulting higher fixed costs are more than offset by a saving in compression cost, however. Somewhat more fuel is used in pressure operation because of the somewhat higher temperature level required to reduce the residual methane. Most of this extra heat, but not all, is recovered and is reflected as lower steam cost.

Air partial oxidation . . . At essentially atmospheric pressure this method, Case

3, shows only a slight improvement investmentwise over conventional reforming. There is considerable saving in natural gas but this is compensated by an increase in the power requirement. The higher power requirement is due to compression of the excess nitrogen to 250 psig. for removal by the low-temperature separation. The result is a somewhat higher cost for the production of ammonia.

Elevated pressure advantages . . . Air partial oxidation at elevated pressure has an advantage over the conventional process. As shown in the tabulation for Case 4, a substantial saving in the total production cost is made. Further, the required investment is down about 12 per cent. The saving in natural gas is realized exclusive of steam generation. By condensing process steam from the carbon monoxide shift in the Girbotol stripper a considerable saving in steam generation is effected. The saving in compression for the reformed gas by operation at an elevated pressure is more than offset by the required compression power for the air resulting in a net increase. Other savings in cooling water, catalyst, and plant maintenance contribute a small amount of the total.

What Price Structure Is Used?

The results obtained in an analysis such as this are dependent to some extent on the price structure used. It is interesting to show the effect of higher natural-gas prices on the cost of production. Fig. 3 plots total cost of production per ton of anhydrous ammonia vs. cost of natural gas. The advantage for Case 4 is considerably greater at the higher natural-gas price whereas pressure operation of a conventional reformer becomes increasingly attractive at the lower natural-gas costs.

An economic comparison as presented in this paper is useful in establishing relative merits of various process schemes. However, care should be exercised in drawing conclusions from this type of study. According to the foregoing analysis, air partial oxidation under pressure has been shown to be economically advantageous whereas atmospheric pressure operation is not particularly interesting.

"For either atmospheric or pressure operation, the process has other potential advantages which have not been credited. These are the adaptability of the process to other fuels such as liquid hydrocarbons and use of the process with an already existing hydrogen stream."

Other advantages . . . However, for either atmospheric or pressure operation the process has other potential advantages which have not been credited. These are adaptability of the process to other fuels such as liquid hydrocarbons and use of the process in conjunction with an already existing hydrogen stream. In any particular study these factors may be very important and influence the choice of process. Disadvantages not considered in this study, are, of course, the unforeseen difficulties which might be encountered in engineering and constructing the plant for carrying out this process. With the conventional process, plant experience has shown pretty well what to expect in the way of maintenance, catalyst life, and fuel economy.

Pilot-plant tests on the air partial oxidation step have been undertaken. The data so far obtained, as well as commercial plant data at moderate pressures, have demonstrated the operating feasibility of the process under the conditions used.

TABLE 4—COST SCHEDULE

Natural gas	$0.22 per M.s.c.f.
H_2O (cooling tower)	$0.015 per thousand gallons
Electric power	$0.0006 per kw.-hr.
Steam	1.4 M.s.c.f. of natural gas per thousand pounds
Catalysts and chemicals:	
Reforming 5-10-year life	$1.15 per pound
Conversion 5-year life	$0.65 per pound
Methanation 3-year life	$2.18 per pound
Synthesis 5-year life	$0.58 per pound
Amine	$2.57 per gallon
Caustic	$0.03 per pound
Operating labor and overhead	$2.00 + $0.25 per hour
Supervision and control	50 per cent of operating labor
Plant maintenance	3 per cent of total investment per year
Operating supplies	$0.65 per ton of ammonia
Fixed costs	12.5 per cent of investment per year

TABLE 5—OPERATING COST
(120 Tons per Day Anhydrous Ammonia Production—Dollars per Ton)

	1	2	3	4
Natural gas at 22 cents per M.s.c.f.:				
(a) Process	$4.91	$4.91	$5.46	$5.85
(b) Process fuel (incl. purge credit)	2.02	2.53	0.55	0.68
(c) Steam generation	2.95	2.55	3.63	1.08
Cooling water at 1.5 cents per M. gal.	1.19	1.15	1.19	0.83
Electric power at 0.6 cent per kw.-hr.	5.16	4.06	6.31	5.32
Catalyst	1.60	1.57	0.94	0.94
Chemicals	0.24	0.24	0.82	0.82
Operating labor and overhead at $2.25 per hour (six operators per shift)	2.70	2.70	2.70	2.70
Supervision and control at 50 per cent of operating labor	1.35	1.35	1.35	1.35
Plant maintenance at 3 per cent of investment per year	2.90	3.00	2.84	2.50
Operating supplies	0.65	0.65	0.65	0.65
Fixed costs at 12.5 per cent of investment per year	12.10	12.54	11.83	10.43
Total	$37.77	$37.25	$38.27	$33.15

Acknowledgment

The authors wish to acknowledge H. L. Thompson's suggestion than an economic study be made to evaluate the process shown as Case 4 in comparison with conventional primary and secondary reforming. Credit is also due to Dr. Robert M. Reed and others whose suggestions were used in preparing the paper. Permission by Girdler Corp. to publish this paper is appreciated. The information presented here is taken from a paper presented before the American Institute of Chemical Engineers.

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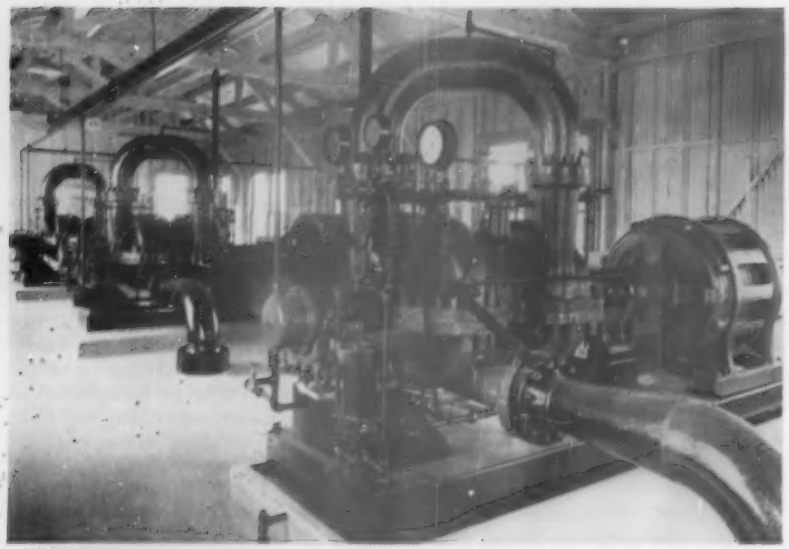


PUMP ROOM of Los Banos booster station has four-stage pumps driven by open-type induction motors. Small pipes on unit in foreground are for testing mechanical seals.

Where's the operator? He's 81 miles away from . . .

Los Banos: Unusually Designed Automatic Pipeline Station

by W. B. Knupp

REMOTELY controlled Los Banos booster station pumps unattended in the heart of California's San Joaquin Valley. Its operator is 81 miles away at Los Medanos tank farm where he attends to his regular duties and considers Los Banos booster as an incidental detail. Located on the Standard Oil Co. of California 18-in. crude line from Kettleman to Los Medanos, Calif., this station is one of the country's largest unattended, automatic pipeline installations.

Other than its size, the station has many other features which merit attention by pipeline engineers, since its designers deviated from usual design practices in several respects. As an example, the station is equipped with conventional, open-type motors having no forced ventilation and having no protective firewall separating them from the pump units. Another is the complete absence of any throttling device for control of the station discharge pressure. Also unusual, from an operational standpoint, is the practice of starting the station with a fully open discharge gate.

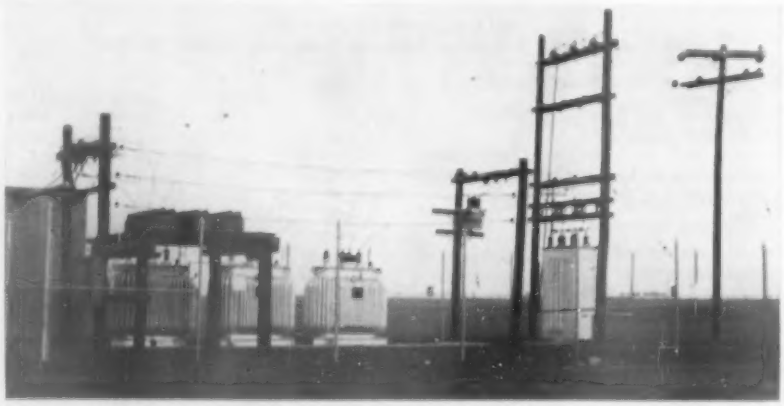
Since the performance of the station has been satisfactory and efficient, and its record unmarred by mishap, pipeline engineers could well afford to consider these uncommon design features when planning for a similar unattended booster station.

The station is located in the hydraulic center of an 18-in., 177-mile pipeline through which several grades of crude oil are batched from the Kettleman Hills oil fields to Los Medanos tank farm near Pittsburg, Calif. The principal pump station is Kettleman, whose centrifugal pumps are powered with condensing steam turbines. Several other stations also pump into the line in the first 25-mile section.

The 18-in. pipe has a wall thickness of ¼ in. with a minimum yield strength of 52,000 psi. Maximum allowable working pressure is established at 940 psi., resulting in an allowable working fiber stress of 34,000 psi. without any allowance for longitudinal-weld efficiency or plate-thickness tolerance. This high fiber stress has proved entirely satisfactory, and there has never been a failure in operation due to the pipe being overstressed, even though the pressure is maintained almost constantly at the maximum allowable.

Pumping equipment . . . The Kettleman-Los Medanos pipeline was designed in 1946 to pump the entire 177 miles without an intermediate booster, but increasing throughput soon required that a booster station be built. Most of the equipment was available second-hand from other abandoned pump stations, and this largely dictated the selection of major components.

The station is equipped with one 800-hp. and two 700-hp. electric-motor-driven centrifugal pumps connected in series. The 2,300-volt, 3-phase, 1,800-r.p.m. motors are of the open, squirrel-cage type and are started across the line. Pumps are four-stage, 1,800 r.p.m., and are equipped with mechanical seals. Motor starters and electrical-control equipment are located in a separate building about 50 ft. from the pump house. Each pump has electric-motor-operated suction and discharge valves and a check bypass valve. Pumps and motors are direct connected and are



ELECTRICAL SUBSTATION at Los Banos required installation of the condenser bank at left for motors which start across the line.

BLOCK VALVES and scraper trap at Los Banos. Scraper normally bypasses station but trap was installed for use during any unusual line conditions.

mounted in the pump house without a fire wall between them.

Control system . . . Remote operation is accomplished by code ringing over a privately owned telephone system. This type of remote control was selected because it required no alterations to the existing telephone system, and resulted in minimum first cost. The pumps may be monitored, started, or stopped, and the code for each operation is sent automatically by pushing a button at either Kettleman or Los Medanos. Monitoring a unit is accomplished by connecting a telephone transmitter mounted directly over the unit involved.

Whenever a unit is idle, both suction and discharge valves are closed and the pump is kept full of crude oil. A small relief valve on each pump prevents overpressure due to temperature increases. Upon receipt of the remote starting signal, both suction and discharge valves open, at which time the motor will start if all safety devices are in the correct position. If one or more of the safety devices are not correct, the motor will not start and the suction and discharge valves will close automatically after a 10-second time delay.

Some of the safety devices lock out and require manual reset, and others reset automatically when the faulty condition is eliminated. Safety devices are provided to shut the station down under the following conditions:

1. Low suction pressure.
2. High discharge pressure.
3. Excessive mechanical seal leakage.
4. High sump level.
5. High bearing temperature.
6. Low voltage.
7. Motor overload.

The low suction pressure shutdown is a particularly important safety feature because it provides an emergency method of shutting down the station in case of failure of the telephone system. This may be done simply by slowing down Kettleman station for several minutes. A time lag of about 2½ minutes is inherent in this method because a pressure wave in this line travels at a speed of only about 40 miles per minute. The low-suction-pressure shutdown device also protects against cavitation.

Seal-failure protection . . . Although mechanical seals have been developed to a high degree of reliability, seal failure probably represents the greatest hazard for an unattended station next to low suction pressure and high discharge pressure. It is essential that protection be automatic in case of seal failure. At Los Banos, seal leakage passes through a float chamber and thence to the sump through a small orifice. Excessive seal leakage causes the float chamber to fill and thus operate a float switch which shuts down the pump and closes its suction and discharge valves. This shuts off all leakage until repairs can be made. The sump pump is normally controlled by a float switch, but if this pump should fail and the sump threaten to overflow, an emergency float switch will shut down the entire station and close all suction and discharge valves.

No throttle valve . . . Normally, a station of this type would have a pressure-limiting throttle valve in the discharge line to permit continuous operation at the maximum-allowable pressure without overpressuring the pipeline. This has been omitted at Los Banos because the added capacity obtainable by use of a discharge throttle valve is not required. Such a valve would be indicated in a similar installation, if maximum capacity were needed.

Because of the absence of this valve, suction pressure on the third pump is telemetered to Los Medanos so that the operator at that point will not start this unit if it would increase the operating pressure above the maximum allowable. Flow rate at Los Banos is also telemetered to Los Medanos and Kettleman to advise immediately of a serious leak in either section.

Open-line starting . . . An unusual feature of this installation is that the pumps are started with open suction and discharge valves with no throttling device between the pumps and the main pipeline. This was done only after considerable study was made regarding the pressure surges that would result from such a procedure inasmuch as the motors reach full speed in several seconds.

Actual experience has indicated no cause for alarm, and no hazardous surges have been observed upon start-up. When a unit is shut down, a pressure wave is sent towards Kettleman, but by the time this reaches the high-pressure region of the pipeline the wave has attenuated to the extent that it is not hazardous.

Another unusual feature is that there is no automatic pump vent. Originally, we were reluctant to omit the automatic venting equipment because we had always considered venting a centrifugal pump after it had been shut off the line as standard procedure. It has been found that by attempting to keep the pump full when shut down, only a small amount of air enters during shutdown due to popping of the temperature relief valve and leakage of the mechanical seals, and that this air is quickly swept away after the pump is started. It is our thought at present that the installation is probably safer without automatic venting equipment than it would be with this equipment.

If we were to build this station now, we would do it almost the same except that weatherproof motors would be used and the pump house would be eliminated. This would not only reduce the first cost, but would be an added precaution against the buildup of vapor concentration that might result due to accidental oil leaks.

From our experience with the Los Banos station, we consider unattended, remotely operated booster stations to be safe, practical, and economical, and anticipate that increasing use will be made of them.

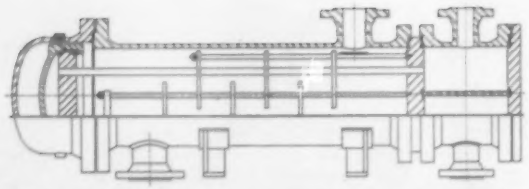
THE AUTHOR

W. B. Knupp, chief engineer of Standard Oil Co. of California's pipeline department, was born and reared in Santa Monica, Calif. After receiving a bachelor of science degree in mechanical engineering from University of California, he joined Standard's engineering department where he worked primarily on pipeline problems. In 1950, he transferred to the pipeline department and was appointed to his present position in 1952.

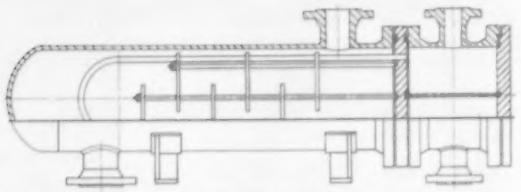
What Determines Which Heat Exchanger Is Your Best Buy?

That's more than a $64 question nowadays. Knowing the right answer can cut your refinery or field-processing equipment costs by hundreds or thousands of dollars. This article can help you because it analyzes the comparative construction and capabilities of basic heat-exchanger types and gives cost graphs for various types and sizes of exchangers. It's the kind of information that the right answer requires.

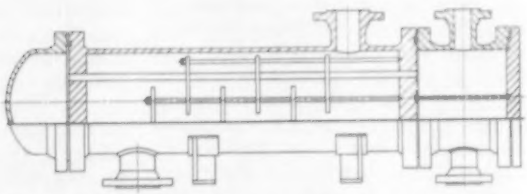
by E. D. Anderson and E. W. Flaxbart



FLOATING-HEAD exchangers are relatively costlier, but can be cleaned easiest, offer easy tube replacement, and provide differential expansion between tube and shell. Fig. 1.



U-TUBE exchangers cost slightly less, but are harder to clean and cause tube-replacement problems. They, too, provide for differential expansion between tube and shell. Fig. 2.



FIXED TUBE-SHELL exchangers are lowest in cost, hardest to clean, make tube-changing difficult, and do not provide for differential expansion—though it can be added. Fig. 3.

SHELL-AND-TUBE heat-exchanger equipment usually constitutes from 5 to 15 per cent of the total equipment cost of a new gasoline plant or refinery. The selection of the proper exchanger system is very important, for upon it depends the size of the fired heaters and cooling towers—items which demand continuing operating expense. The more heat transferred by process heat exchangers, the smaller the fired heaters and cooling towers.

Authors are chief engineer and chief rating engineer, respectively, Western Supply Co., Tulsa. Paper presented at the ninth annual petroleum mechanical engineering conference, Los Angeles, September 27, 1954.

It is necessary for the process engineer to make this economic balance and specify what he thinks to be the most economical exchanger system. But the selection is not a simple one. Corrosion, product contamination, pumping costs, and various other process considerations add to the complexity of the problem. The estimating curves presented here give cost comparisons between various types of shell-and-tube exchanger construction, thus facilitating the selection of the most economical exchanger system.

Construction features . . . This discussion will be confined to various types of shell-and-tube heat exchangers for they are by far the most widely used of all types of exchange equipment. There are three basic types: the floating head; the U-tube; and the fixed-tube sheet. As background for the cost curves, the following review of the features and variables of these exchangers are presented.

Experience has shown that ¾-in. o.d. and 1-in. o.d. tubes are the preferable sizes. With these diameters, adequate velocity for good heat transfer without excessive pressure drop can usually be attained by proper selection of tube

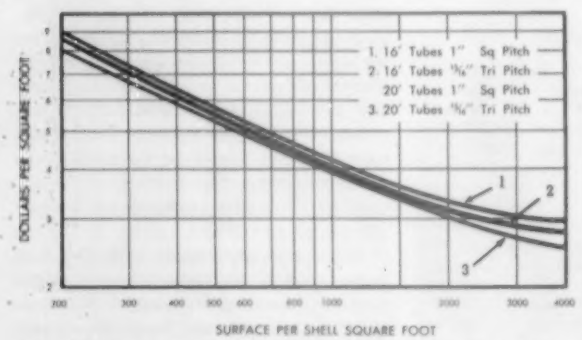

1. 16' Tubes 1" Sq Pitch
2. 16' Tubes 1" Tri Pitch
20' Tubes 1" Sq Pitch
3. 20' Tubes 1" Tri Pitch
DOLLARS PER SQUARE FOOT
SURFACE PER SHELL SQUARE FOOT

Fig. 4—Cost for all-steel, floating-head exchangers with ¾-in. o.d. by 14 B.W.G. tubes, 150-psi. design pressure.

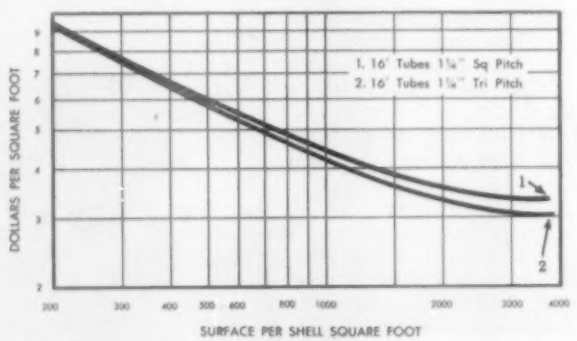


Fig. 5—Cost for all-steel, floating-head exchangers with 1-in. o.d. by 12 B.W.G. tubes, 150-psi. design pressure.

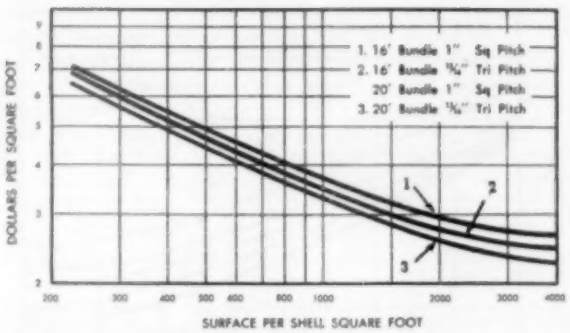

1. 16' Bundle 1" Sq Pitch
2. 16' Bundle 15/16" Tri Pitch
20' Bundle 1" Sq Pitch
3. 20' Bundle 15/16" Tri Pitch
DOLLARS PER SQUARE FOOT
SURFACE PER SHELL SQUARE FOOT

Fig. 6—Cost for all-steel, U-tube exchangers with ¾-in. o.d. by 14 B.W.G. tubes, 150-psi. design pressure.

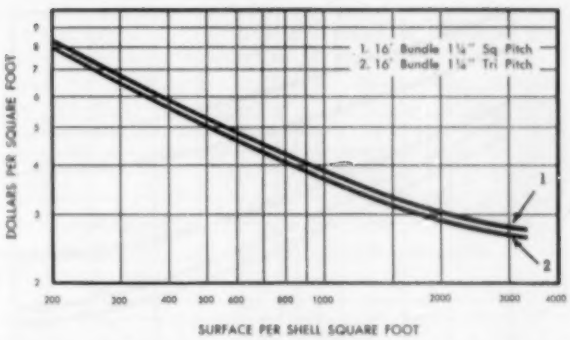


Fig. 7—Cost for all-steel, U-tube exchangers with 1-in. o.d. by 12 B.W.G. tubes, 150-psi. design pressure.

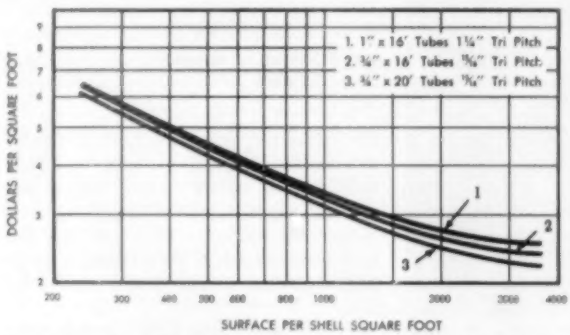

1. 1" x 16' Tubes 1¼" Tri Pitch
2. ¾" x 16' Tubes 15/16" Tri Pitch
3. ¾" x 20' Tubes 15/16" Tri Pitch
DOLLARS PER SQUARE FOOT
SURFACE PER SHELL SQUARE FOOT

Fig. 8—Cost for all-steel, fixed tube-sheet exchangers with 1-in. o.d. by 12 B.W.G. tubes or ¾-in. o.d. by 14 B.W.G. tubes.

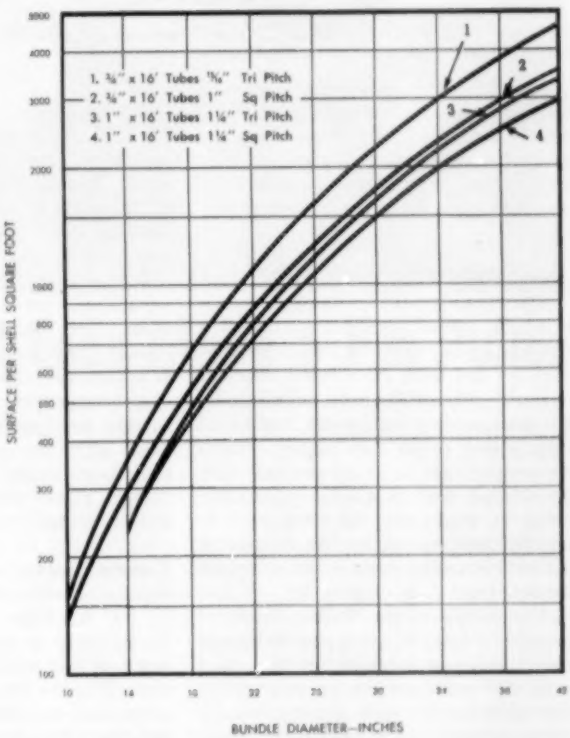

1. ¾" x 16' Tubes 15/16" Tri Pitch
2. ¾" x 16' Tubes 1" Sq Pitch
3. 1" x 16' Tubes 1¼" Tri Pitch
4. 1" x 16' Tubes 1¼" Sq Pitch
SURFACE PER SHELL SQUARE FOOT
BUNDLE DIAMETER—INCHES

Fig. 9—Heat-transfer surface vs. bundle size. Bundle diameter plays an important role in determining additive costs.

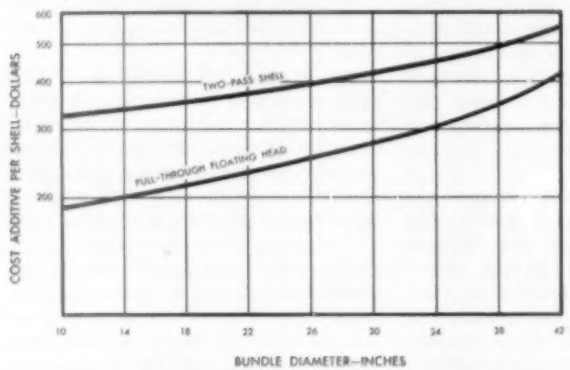


Fig. 10—Cost additives for pull-through floating-head and two-pass shell based on bundle diameter.

passes. The diameters are large enough to permit cleaning, and wall thicknesses of 12 to 16 B.W.G. provide sufficient metal for a wide range of pressures without excessive cost or weight. Tubes of these diameters and gages are considered stock items by most heat-exchanger manufacturers and are readily available for exchanger retubing.

In the past, there were as many tube lengths as there were manufacturers and purchasers of heat-exchange equipment. This led to extremely difficult stocking problems and was a disadvantage to users as well as exchanger manufacturers. Now, 16 and 20-ft. tubes are considered standard. The 16-ft. tube is used primarily in refineries where space is limited and, because of fouling, ease of bundle handling is necessary. In gasoline plants, where space is usually no problem and the fluids are clean, 20-ft. tubes are widely used.

Because of the ease of handling, maximum shell diameters of around 36 in. are generally preferred in refineries, with larger diameters up to 42 or 44 in. being used for gasoline plants. The size selection is based on handling equipment available in the plant. This may seem inconsistent, but, since in most gasoline plants the fluids handled are noncorrosive and nonfouling, little maintenance is required.

For ordinary pressures, the tube gages usually used on 1 in. 12 B.W.G. or ¾ in. 14 B.W.G. for carbon steel and the low chrome alloys, and 1 in. 14 B.W.G. or ¾ in. 16 B.W.G. for admiralty and the nonferrous metals. Tubes of these gages are readily available from warehouse or manufacturers' stock.

Tube pitches are laid out on either a square or triangular configuration. Triangular pitch is used for clean and nonfouling shell-side fluids. This tube pitch results in a higher transfer coefficient for a given pressure drop than square pitch. Square pitch is used for fouling fluids where mechanical cleaning must be employed or where a low pressure drop is required.

With further development of chem-

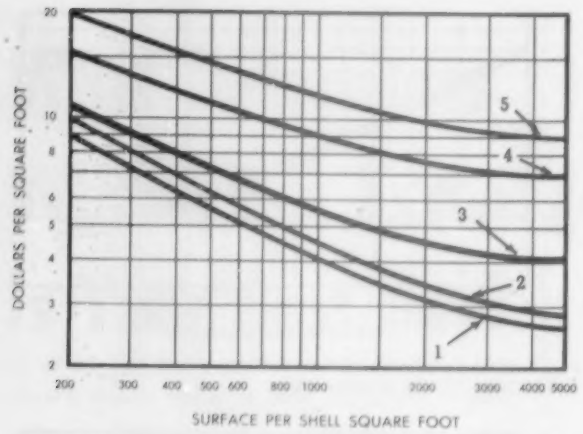


Fig. 11—Variation of costs with construction materials for floating-head exchangers (see text for materials specifications).

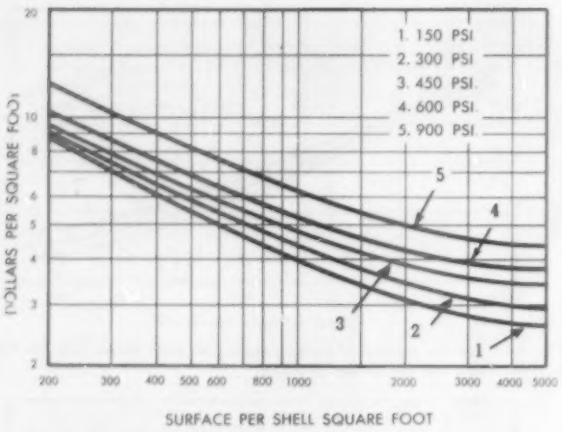


Fig. 12—Costs for all-steel, floating-head exchangers with ¾-in. o.d. by 14 B.W.G. tubes, 15/16-in. tri pitch.

ical and allied cleaning processes, it will be possible to use more triangular pitched exchangers and gain the two-fold advantage of higher transfer rates and lower cost for given exchanger surface.

Comparison of Basic Types

The floating-head exchanger, shown in Fig. 1, makes provision for differential expansion between the tubes and shell by the tube sheet being fixed at one end only. Care must be taken by the designer in selecting the number of tube passes to be sure that the overall temperature drop of the tube-side fluid is not sufficient to overstress the tubes in any pass. However, that is usually compensated for by the use of several exchanger shells in series or split floating-head construction.

The bundle of the floating-head exchanger is readily removable to permit inspection and cleaning of the shell side. The tubes are straight and readily accessible for tube-side cleaning. Should local corrosion or erosion occur, individual tubes can be easily replaced.

The U-tube exchanger, shown in Fig. 2, is slightly lower in cost than the floating head and also provides for differential expansion between shell and bundle. The bundle is removable for cleaning the shell side of the unit; however, close-radius U-bends do present a cleaning problem. The unit has no internal gasketed joint and can be used to advantage where the possibility of product contamination is a hazard. Individual tube replacement is not possible with the exception of the outside rows of tubes.

The fixed-tube sheet exchanger, shown in Fig. 3, is the lowest in cost because of its simplicity of design. As its name implies, the bundle is contained between two tube sheets which are fixed to the shell. The shell side is inaccessible for mechanical cleaning and, unless pressure drop is a consideration, the tubes are on triangular pitch. Usually, this type of exchanger is used where temperature difference between shell and tube fluids is small and no provision is made for differential expansion. It is possible to use expansion joints in the shells of these units to provide for differential expansion. Tube replacement in this exchanger is difficult, although individual tubes may be replaced. Because of its inherent low cost, this type of unit is widely used when expensive alloy construction is necessary, and on low-profit-margin plants where first costs is extremely important.

Construction codes . . . Exchangers are usually constructed under Section VIII of the A.S.M.E. Boiler and Pressure Vessel Code or under the rules of the A.P.I.-A.S.M.E. Code for Unfired Pressure Vessels. These codes set out the minimum requirements for safe construction. The heat exchanger industry recognized that these rules applied to vessel construction only, and left glaring voids when applied to heat exchangers.

To fill this need, the Standards of Tubular Exchanger Manufacturers Association were developed. These standards, which supplemented the vessel-construction codes, have become accepted as a code for the safe construction of exchangers. The cost data presented in this paper are based on T.E.M.A. construction.

Costs . . . Fig. 4 shows the cost per square foot of external tube surface of ¾-in. tubed floating-head exchangers. The cost curves of ¾-in., 16-ft. tubes on 1⅛ triangular pitch and ¾-in., 20-ft. tubes on 1-in. square pitch is so nearly alike that the curves almost coincided. For estimating purposes the cost can be considered identical. It will be noted that cost per square foot of surface decreases rapidly in the small surface range and tends to level out for the larger exchangers. This relation holds true regardless of the type of construction.

Fig. 5 shows cost data for 1-in., 16-ft. tubed exchangers on 1¼ square and triangular pitch. Cost figures for 1-in., 20-ft. tubes were omitted because this diameter-length combination is seldom used.

Fig. 6 shows cost curves for U-tube exchangers with ¾-in., 16 and 20-ft. tubes on 1 in. square and 1⅛ triangular pitch. Here again, the cost per square foot of 16-ft. tubes on triangular pitch is almost identical with 20-ft. tubes on square pitch so a single curve is used. In describing a U-tube exchanger, the 16-ft. or 20-ft. dimension refers to the nominal bundle length. The tubes from which these bundles are fabricated are actually twice the length of the bundle.

Fig. 7 shows cost curves for 1-in. tubes in 16-ft. bundle-length U-tube exchangers on 1¼ square and triangular pitch. As in the case of the floating-head units, the cost per square foot, using 1-in. tubes, is greater than in ¾-in. tubed exchangers.

Fig. 8 shows cost curves for ¾-in., 16 and 20-ft. and 1-in.; 16-ft. tube-length fixed tube-sheet exchangers with the tubes on triangular pitch. Since the shell side of these units is inaccessible for cleaning, triangular pitch is almost universally used to achieve the lowest cost per square foot.

Figs. 9 and 10 show the additive costs based on bundle diameter for pullthrough floating-head units and two-pass shell units with expandable longitudinal baffles. Pullthrough floating-head construction permits removal of the tube bundle without first removing

the shell cover and the floating-head cover. However, to accomplish this it is necessary to increase the shell diameter to allow passage of the floating-head closure.

With this construction, adequate sealing between the shell inside diameter and the bundle periphery must be provided to prevent excessive fluid bypass. The two-pass shell unit is used as an economic expedient where, due to temperature ranges, it is necessary to achieve countercurrent flow conditions or conditions approaching countercurrent flow. This can be accomplished by using a number of shells, but, referring back to Fig. 4, it can easily be seen that it costs less to buy a two-pass shell of large surface rather than two smaller-surfaced shells stacked in series.

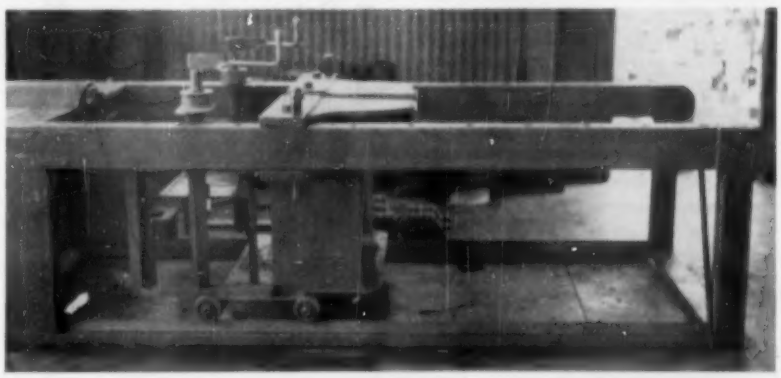
Fig. 11 shows comparative costs for other materials of construction for the ¾-in., 14-gage, 16-ft., steel-tubed exchangers with tubes on ¹⅞ triangular pitch. For estimating purposes, approximately the same cost ratio as shown here will exist in the U-tube and fixed tube-sheet exchangers. In the graph, No. 1 refers to 14 B.W.G. tubes, all steel. No. 2 refers to 16 B.W.G. tubes, aluminum bundle and channel. No. 3 refers to 16 B.W.G. tubes, all-brass bundle. No. 4 refers to 14 B.W.G. tubes, four to six chrome bundle. No. 5 refers to 16 B.W.G. tubes, 304 stainless bundle and channel.

Fig. 12 is presented to give an indication of the magnitude of increase in cost with an increase in pressure. This relationship is not necessarily valid for other types of construction, or floating-head exchangers with different tube pitch, length, and diameter. Since in high-pressure design many construction variations are possible which will reduce the over-all cost, it is advisable to consult the manufacturer.

In determining the most economical selection of exchangers, the process engineer should consider the longitudinally finned, double-pipe section which can be arranged in series-parallel banks to form an exchanger system. This type of exchanger is most economical for low flow rates, fluids with widely different heat-transfer characteristics, and when countercurrent flow is not economical in shell-and-tube exchangers. The cost of finned surface for the standard 100-sq. ft. section in steel construction is approximately $2.50 per square foot; with admiralty finned tubes, the cost is approximately $3.50 per square foot.

The shell and finned-tube exchanger having the widest range of application employs low circumferentially finned tubes having an outside tube surface from two to three times that of the corresponding bare tube. The surface is highly efficient and economies can be attained, especially where the surface requirement is large. As in the longitudinally finned units, the greatest saving results when the heat-transfer characteristics of the two fluids are widely different.

Conclusion . . . These cost curves were presented to give actual cost data rather than ratios and trends. The exchangers required by new, high-temperature, high-pressure processes do not lend themselves to clear presentation on a cost curve. In most cases, pressures, temperatures and materials are different on the shell and channel sides with the result that each requirement is a specific design problem. For estimating costs of these exchangers, it is best to discuss the problem with the manufacturer, who will develop costs for the specific designs required.



Odds and Ends Make a Pin Puller

SPARE parts and scrap metal were used to construct a unit for removing pins from bushings and other plant maintenance work where hydraulic pressure is required.

The unit consists primarily of a hydraulic press mounted horizontally, a traveling cart for supporting the part being worked on, and a frame, including rails for the cart.

The hydraulic press is mounted at one end of the frame and is supported by two short lengths of a wide U-beam, mounted vertically. The press is completely accessible so that it may be easily operated.

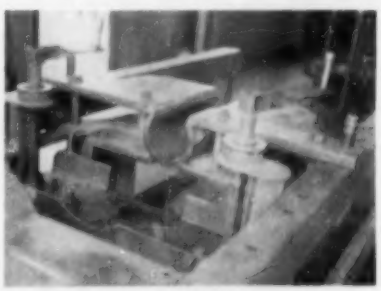
The traveling cart is mounted on pulleys which run along inverted angle-irons welded to the bottom of the frame. The bottom of the cart consists of a portion of plate steel with two short lengths of wide U-beam for vertical supports. The front half of the cart consists of a platform which may be raised or lowered to accommodate various pieces of equipment. Vertical movement is imparted to this platform by means of two threaded rods which pass through two bolts welded at each end of the platform. The rods are squared at their tops and handles are used to turn them and so raise and lower the platform.

The rear half of the cart is used to back up the piece of equipment being worked on. It is made of heavy steel plate, adequately reinforced. A short length of heavy-duty pipe is welded into the steel plate, with a longitudinal strip being cut out of the top portion of the pipe. Rods or pins forced out of equipment are deposited into this pipe and conveniently removed through the slot. The steel plate on the rear half of the cart extends outward so it runs just above and below the two upper horizontal-frame members.

The far end of the frame away from the press is left open so it will not be a limiting factor in handling equipment.

The entire unit is positioned beneath an overhead rail so it may be used to lift equipment on and off the cart.

The hydraulic-press unit was constructed and is in use at LaGloria Corp.'s Falfurrias, Tex., cycling plant.



PLATFORM which supports bushing being worked on. Handles are used to raise or lower platform as desired.

Here's a concise examination of today's techniques for . . .

Making Analytical Engineering Appraisals

by Dean H. Sheldon

- Estimating the amount of future recoverable hydrocarbons.
- Calculating income expected from estimated reserves.
- Estimating expense involved in operating the wells or leases.
- Determining the resulting operating profit expected.

AN analytical engineering appraisal is an estimate of the quantity of hydrocarbons that may be recovered from an oil or gas reservoir and the profit that may be derived from their sale.

In defining the term "future recoverable hydrocarbons," a petroleum engineer cannot permit intangible quantities to become a part of his classification of oil and/or gas reserves. For the purpose of analytical engineering appraisals, reserves should be defined as that oil which is **proved,** to a high degree of probability, to exist; which is producible by operating techniques known today; and the production of which will provide a reasonable profit after the payment of all costs and return of invested capital.

Two classes of reserves . . . Estimates of future recoverable oil and gas otherwise known as oil and gas reserves, in presentation, should be separated into two classes. Developed reserves are those hydrocarbons which will be produced through bore holes that are capable of production at the time the appraisal is prepared. Undeveloped reserves are those hydrocarbons which are proved, to a high degree of probability, to exist, but the production of which will require the investment of additional capital. The quantities of future recoverable oil and gas estimated for the proved undeveloped land are of necessity less reliable than the estimates of oil and gas reserves prepared for property that has been drilled and is producing.

There are three general methods of estimating future recoverable oil and/or gas. Any method used has its limitations, and the engineer should be well aware of them. An eminent reservoir analyst has said that "During the past 20 years, the decline curve has faded from the scene and many new concepts have been added."[1] However, there are many properties producing at or close to their capacity and are susceptible to analysis through the use of production decline graphs, the oldest and still most reliable method of preparing reserve estimates.

Author is a petroleum engineer, South Pasadena, Calif. Paper presented at 1954 meeting of Pacific Coast District, A.P.I. Division of Production.

The strength of the method lies in its adaptability to the scheduling of future production and its historical acceptance. An estimate of reserves thus prepared is in reality the sum of anticipated future production rates, a feature nonexistent in other appraisal procedures.

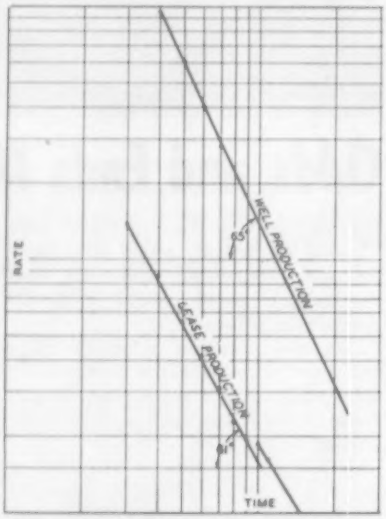


Fig. 1—A slope of approximately two to one indicates production by gas depletion.

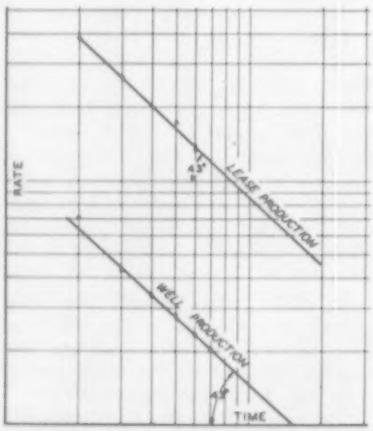


Fig. 2—A slope of one to one indicates that water is the dominant production cause.

The principal requirement for its validity is a past history of production at or very close to capacity rates. Statistical methods of estimating reserves are also used but their preparation and projection are more laborious than graphic procedures.

Rate against time . . . There are several types of production-rate-decline graphs. The most common type of production graph plots production rate against time, and the resulting curve may be hyperbolic in character. This type of curve when properly adjusted plots the log of production rate against the log of time as a straight line. Moreover, its projection is made with ease and facility. The slope of the line on log-log coordinates often indicates the controlling production mechanism. The position of the line with respect to the coordinates many times indicates the size of the reservoir being drained by the well or wells.

A production-decline curve that plots as a straight line on log-log paper and that has a slope of approximately two to one (Fig. 1) indicates that gas depletion is the primary production mechanism.

A graph that has a slope of one to one (Fig. 2) would indicate that water was probably the dominant source of energy for production of the hydrocarbons. A graph with a slope of one or less that abruptly increases to six or seven to one (Fig. 3) may be the product of gravity drainage. The extrapolation of production decline curves can be made with confidence if additional examination supports the analysis of the producing mechanism provided by the character of the curve.

Production-decline curves that plot as a straight line on semi-log paper are characteristic of constant percentage or exponential decline. The oil reservoirs that have a production history of this type are limited in number. There are, however, many fields that may exhibit this feature for a limited portion of their productive life.

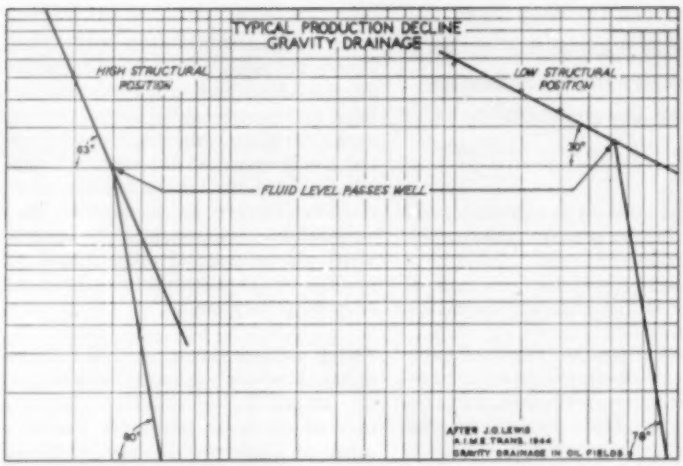


Fig. 3—A slope of one or less that abruptly increases to six or seven to one may be the product of gravity drainage.

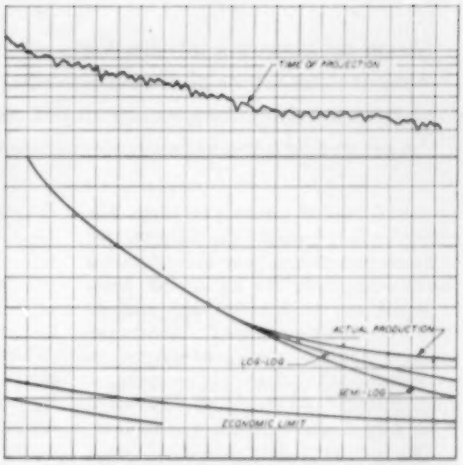


Fig. 4—Using semilog plots to develop reserve estimates from partial histories can cause grave errors.

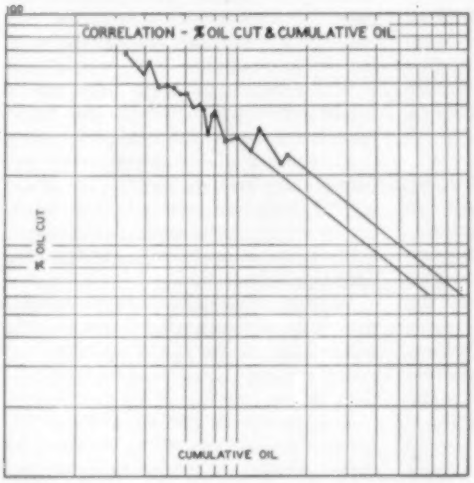


Fig. 5—Reservoir with an uninterrupted increase in water cut.

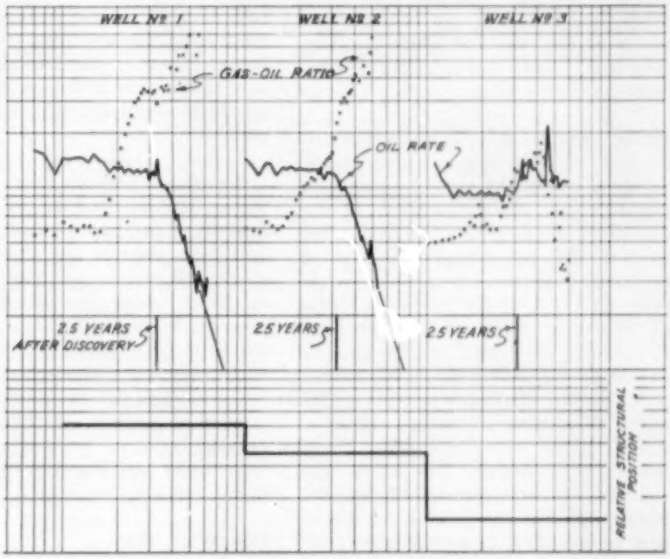


Fig. 6—(Right) Gravity drainage in actual reservoir.

The use of semilog graphs is popular, and they are easy to plot. Their projections are easily read. Further, they are susceptible to quick graphic presentation and analysis.

Semilog timing different . . . Semilog decline-curve projections will often produce reserve estimates comparable to those obtained by the log-log method. The timing of the production, however, may be quite different. The use of constant percentage decline for a reservoir, whose decline characteristic is hyperbolic, results in an overestimate of the early production rates and an underestimate of the later settled rates and the life of future production.

Semilog plots are commonly used for development of reserve estimates from partial histories of a well, lease or field. This practice can produce errors of considerable magnitude. (Fig. 4). The semilog projection of settled production trends yields a large portion of its reserve in the early years. The initial production rates being high and the future life short, the estimated operating cash profit is apt to exceed actual realization.

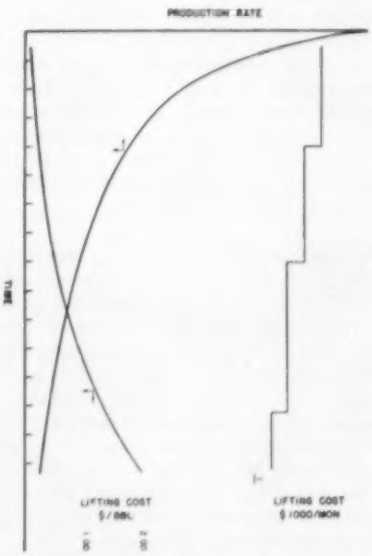


Fig. 7—How direct well costs per barrel of oil produced rise as production declines.

Other types of production-decline graphs do not contain a rate-time relationship. Production rate-cumulative oil, the pressure drop-cumulative oil, and the per cent oil in fluid-cumulative oil correlations are useful primarily as checks on the results of estimates obtained by the use of some other method. The rate-cumulative method requires production at capacity rates in order to provide valid results. The pressure drop-cumulative oil relationship assumes a constant productivity index. It is best applied where initial solution gas-oil ratios are low.

The oil cut-cumulative correlation, when used for multisand reservoirs, fails to account for the large amounts of oil that are, many times, recovered after the appearance of large quantities

"Accurate estimates of the tank oil in place cannot be made without some means of direct correlation between the permeability of the producing zone measured with air and the permeability of the producing zone at reservoir conditions."

of water in the produced fluid. For example, Fig. 5 shows the field history of an oil reservoir with an uninterrupted increase in water cut up to the point at which the oil was 25 per cent of the total fluid produced. A routine projection at this time would have given an estimate of ultimate oil recovery of approximately 6,800,000 bbl., with a 5 per cent oil cut as the economic limit.

The property has produced since reaching a 25 per cent oil cut or a 75 per cent water cut approximately 500,000 bbl. of oil. The per cent oil in gross fluid is still 25 per cent. An increase in the estimated ultimate oil recovery of 32 per cent over the previous value is indicated.

Easily understood . . . The volumetric method of estimating oil and gas reserves is one of the most popular tools available for the preparation of the analytical engineering appraisal. The method does not indicate the type of production mechanism at work in the reservoir. It does not provide a means of estimating future production rates. It produces an estimate of the ultimate barrels to be recovered. It does yield quick results. Its theory is easily understood. It is most useful as a means of estimating oil and gas reserves during the early productive life of a field reservoir. At this time, development is incomplete and the production history may be too short to permit the reliable application of other estimating methods. The greatest value of the volumetric approach lies in its simplicity and use as a yardstick for comparison of estimates prepared by other means and for analogy with other properties.

The factors used in the volumetric formula and methods used for their determination are well known.

$$\text{Ultimate recoverable oil, bbl.} = \frac{7{,}758\ AHP\ (1-Iw)\ R}{FVF}$$

where:

7,758 = bbl. per acre-ft.
A = productive area, acres
H = thickness of net productive sand, ft.
P = pore space, per cent of bulk sand volume
Iw = interstitial water, per cent of pore space
FVF = formation volume factor, bbl. of oil in the reservoir per bbl. of tank oil at original conditions of pressure and temperature
R = recovery factor, per cent of tank oil originally in place

The areal extent of the productive sands can be developed from electric-log analysis, cores, formation, and production tests. The accuracy of estimates of proved productive acreage is directly proportional to the stage of the field development at the time the estimate is prepared. One phase of the determination of the areal extent of an oil reservoir that is often omitted from consideration is the possible existence of a tilted water table and its influence on the productive limits of the field or pool.

Get sufficient porosity data . . . Porosity values can be obtained by laboratory analysis of core samples and by calculation from electric log data. The size of the oil and/or gas reservoir varies in direct proportion to the average porosity value used. This value fixes the amount of space, per unit volume of the reservoir, that will be available for storage of oil, gas and water. The number of porosity determination made on samples of the reservoir rock are in many cases insufficient to be considered truly representative data.

Interstitial water . . . The amount of water that occupies the interstices in the reservoir is estimated from analysis of cores taken with oil base drilling fluid or by the restoration of original water saturations in the laboratory. Interstitial water content can be evaluated from electric-log data or approximated by correlation with reservoir rocks of equivalent permeability values and comparable lithologic character.

Use permeability to brine . . . Measurements of permeabilities with actual oil-field brines should be encouraged. The permeability value when measured with air may be many times the permeability when measured in the presence of fresh water or oil-field brines. Accurate estimates of the tank oil in place cannot be made without some means of direct correlation between the permeability of the producing zone measured with air and the permeability of the producing zone at reservoir conditions.

Considering the change in permeability values of some oil-producing sand when measured with air, with fresh water, and with oil-field brine, the indicated interstitial water content related to air permeability would be less than the actual interstitial water content under reservoir conditions. Therefore, without the benefit of direct correlations between air permeability and permeability measured with connate water, the estimate of original tank oil in place would exceed the actual volume of tank oil in place.

Fixing volume factor . . . The determination of the formation volume factor for use in the volumetric formula may be made by laboratory measurements of a subsurface sample of the oil and its associated gas or by the recombination at reservoir pressures and temperatures of the produced oil and gas. The formation-volume factor thus obtained is often not representative of the whole reservoir. It is not unusual to find estimates of large quantities of future recoverable oil and gas based upon the analysis of a single laboratory determination of the pressure-volume-temperature relationship of the crude oil and associated gases. It is astonishing to see the large capital investments made upon estimates prepared from inadequate information.

Without direct laboratory determination of the pressure-volume-temperature relationship of the crude oil and associated gas, the use of published correlations on the behavior of oil field hydrocarbon systems is desirable. Even laboratory results should be verified by such correlations before they are accepted as being representative of the entire reservoir.

Recovery factor difficult . . . The determination of the recovery factor for the volumetric formula is difficult. A wide range of opinion concerning the amount of the original tank oil in the reservoir that can be recovered often is developed from consideration of the same basic data by several individuals. Certain recovery factors acquire an aura of authenticity simply through repetitious usage. Recovery calculations for volumetric estimates of limestone reservoirs of the intragranular type of porosity seem to find the use of a 25 per cent factor to be convenient and popular. Yet calculations of recoverable oil by other methods may well indicate recoveries that vary from 17 to 27 per cent of the tank oil originally in place.

The appraiser should make a serious effort to narrow the margin of possible error in the choice of a recovery factor. Thoughtful consideration should relate the viscosity of the oil, the amount of gas in solution, the permeability of the producing zone, its ranges

and variations, the thickness of the oil saturated section, the angle of dip of the producing members, and the continuity and homogeneity of the producing formation to the recovery factor used. The probable extent of any aquifer that could supply water to the reservoir should receive attention.

In connection with this problem, geologic considerations are helpful. The presence of intense faulting or lenticularity of the producing sand may provide clues as to the effectiveness of water as producing mechanism. Tarner or comparable methods of evaluating the recovery factor for oil and/or gas reservoirs may be of value to the appraisal engineer in analyzing the magnitude of the recovery factor to be used.

Volumetric calculations on a field-wise basis are more reliable than those prepared for particular parcels of land. Under the proper circumstances, gravity can replenish the oil supply of those wells strategically situated in oil reservoirs. Fig. 6 illustrates the gravity drainage operating for a property that contains approximately 48 per cent of the net productive sand volume of the reservoir. Assuming estimates of future recoverable oil for the pool were of the right order of magnitude, this lease has already produced its share of the estimated ultimate recoverable oil and the production rate today is in excess of 50,000 bbl. per month.

Other complicating factors . . . The trend toward pressure maintenance, gas injection, gas-oil-ratio control, and water flooding, as a means of producing oil and gas reservoirs has made the problem of preparing analytical engineering appraisals increasingly complex. Material balance calculations for the estimation of reservoir hydrocarbon volumes have become an important tool of the engineer. Estimates of recoverable portions of the various hydrocarbon substances in a reservoir have been improved by the works of Tarner, Babson, Muskat, and others.

Everyone concerned with the production of oil and gas should realize that the recovery of hydrocarbons from petroleum reservoirs can be predicted with reliability only when the operating conditions, actual or assumed, are specifically set forth.[1] Many analytical engineering appraisals fail to make a statement relating the actual or assumed operating conditions for which the estimates were prepared.

Material-balance methods require large amounts of data. Their careful compilation and maintenance throughout the producing life of the reservoir is essential to the production of reliable estimates. Gas and water-production figures for the early part of the reservoir history are often subject to question. The flaring of gas prior to the installation of gathering lines and processing plants, the production of water before the installation of wastewater-disposal systems, may result in erroneous figures for initial gas-oil ratios, cumulative gas, and water production during the early life of a reservoir.

"Everyone concerned with the production of oil and gas should realize that the recovery of hydrocarbons from petroleum reservoirs can be predicted with reliability only when the operating conditions, actual or assumed, are specifically set forth."

Pressure records should be representative. Adequate buildup time for shut-in pressures and pressure-buildup data is important. Many times well interference exists during the recording of static pressures. Small inaccuracies in pressure data have a profound effect on the results of material-balance calculations.

The composition of hydrocarbon systems is complex and may undergo marked changes from reservoir to reservoir or within the boundaries of the individual reservoirs. The response of these systems to changes of pressure and temperature depends upon their composition. Equities in the oil production from multimillion-barrel fields have been distributed and claims made for the virtue of one method of operation as compared to another from calculations based upon the analysis of a single sample of reservoir oil and gas.

Estimates of oil and gas recovery call for data on the other physical characteristics of crude oil and its associated hydrocarbons. Fluid saturations at different stages of depletion must be computed and related to relative permeability behavior.

The relationship of relative permeability and fluid saturation may be developed from laboratory analysis of core samples or they may be calculated from field performance data. The laboratory results do not show the influence of well completion policies or operating procedures. They represent a limited portion of the oil reservoir. The Kg-Ko relationship developed from field histories is most reliable where past operating methods are to be continued. A change in operating procedure requires a change in the slope of the Kg-Ko curve. The slope change is usually made by analogy with fields that have already experienced the contemplated alteration in operating methods.

Income, Expense, and Profit

The income to be derived from the sale of hydrocarbons produced is usually forecast at current realization in terms of a barrel of oil, i.e., income from the sale of hydrocarbons divided by barrels of oil sold. This is accepted practice. Examination of the method calls for a revaluation of its validity.

In times past, the income recovered from the sale of residue gas, natural gasoline, and liquid petroleum gases was a small portion of the income from oil producing lands. These products in the past accounted for 5 to 10 per cent of the total receipts. This situation no longer exists. Residue gas, natural gasoline, and liquid petroleum gases enjoy for the long-term outlook a reasonable stability of demand and possible improvement in price. Seldom do the ratios of gas and/or allied liquid products to oil remain constant. The appraisal engineer should make a determined effort to understand and forecast the probable production and income from the sales of these substances.

The production of oil, water, and gas by properties, pools, and fields is usually recorded. The record of liquids extracted from the wet gas processed is not as a rule readily available. A review of the literature found only one field for which the historical yield of natural gasoline had been recorded.

A preliminary examination of data for certain California oil fields indicates definite trends in the liquid product yield with depletion of the reservoir. The derivation of empirical relationships between liquid products recovered and oil and/or gas produced is worthy of serious investigation. There are many variables that affect the production of these products. However, a study of the historical relationship between oil, gas, gasoline, and liquid petroleum gases as provided by field data might produce some significant results.

Estimates prepared by the routine process of estimating income from the sale of all hydrocarbon products in terms of a barrel of oil many times result in forecasts of income that will be well below actual realization. This situation prevails particularly when a reservoir is in the initial stages of development or is undergoing a change in operating procedure.

What are the expenses? . . . Estimates of direct well expense are usually prepared after examination of actual cost records. Direct well expense as used

for analytical engineering appraisals should contain those cost items that can be attributed to a particular well or lease. Bookkeeping practices vary but most cost accounting isolates such items as pumping labor; contract labor; material and supplies; fuel, power, and water; insurance; waste-water disposal; transportation; dehydration, etc.

The forecasts of these costs may be made on the basis of a unit charge per net barrel of oil produced or as dollars per well day, month, or year. The former system usually produces an overall estimate of operating cost that is below actual experience. It is difficult for an appraiser to increase the unit cost per barrel of oil produced at a rate that is realistic. The unit cost per barrel is not readily adaptable to changes in the producing character of a well or property, i.e., change from flowing to artificial lift. This method of estimating direct well cost is most adaptable and useful in connection with volumetric estimates.

A forecast of direct well expense as a cost per well per unit of time is logical. The producing method and depth of the well are the basic features that establish direct well expense. The amount of oil or fluid produced may vary over a wide range without effecting a change in the method of production. The direct expense per well or for a lease remains relatively constant. While production rates decline, direct well costs per barrel of oil produced will of necessity increase. (Fig. 7).

Recent years have seen the expense of producing oil rise at a rapid rate. Many properties have experienced an increase of 20 to 40 per cent in direct well expense, exclusive of mineral land and production taxes, since 1950.

All long-term estimates of direct well expense should provide funds for the replacement of well equipment and other facilities. Although the time at which such funds will be expended cannot be specifically forecast, their ultimate use is certain. It is these expenditures which many operators like to think of as nonrecurring but which are inevitable in the long-term operation of an oil property.

Taxes imposed upon the various interests in oil and gas production are varied in form. Fifteen of the oil-producing states calculate their revenue from oil and gas production as a per cent of the gross value of the produced hydrocarbons. Three states levy a mineral production tax as a fixed amount per barrel of oil or per M.c.f. of gas produced with variations on a sliding scale basis that compensate for the difference in price received for the product. These taxing methods are a form of the severance tax: a tax on the value of production as it is taken from the land.

"Recent years have seen the expense of producing oil rise at a rapid rate. Many properties have experienced an increase of 20 to 40 per cent in direct well expense, exclusive of mineral land and production taxes, since 1950."

Properties that are situated within the confines of incorporated cities pay additional taxes on oil production. These take a variety of forms. They are none the less real and should receive attention. There are other assessments made on oil and gas production for support of regulatory and governmental bodies. These are too numerous to consider in detail. They are all, however, part of the cost of producing oil and gas and should be included in estimates of operating expense. Currently the mineral land taxes and other assessments made on oil production in the State of California, amount to approximately 50 per cent of the total direct cost of operating an oil property.

Many estimates of expense are prepared with no provision made for administrative and supervisory costs. A forecast of such items in an analytical engineering appraisal is not always necessary. Properties that are produced under the terms of an operating agreement between the leasehold interests are commonly found in oil property accounts. Joint operation agreements usually provide for payment by the nonoperating interest of a portion of the cost of field supervision and general office overhead.

The determination of the admissible expense to be prorated to the operating interests is made in a variety of ways but two methods are most common. One provides for the payment of supervisory and overhead costs on the basis of moneys expended for the development and the operation of the property. The general range of such agreements provides for a charge of from 2½ to 6 per cent of the cost of development work and from 5 to 10 per cent of the direct operating costs of the property. The second form is based on a fixed fee per well per month. It is not uncommon to find charges of $400 to $500 per month per drilling well made for the cost of supervision and administration. On producing wells, the rates will vary from $30 to $50 per well per month.

A sliding scale charge per well month, according to the number of producing wells, is another common form of the unit charge for supervision and overhead. Where the nonoperating interest must pay such costs by contractual agreement before the receipt of money as its share of the net profits, deductions for supervisory and administrative expense have to be included in the analytical engineering appraisals.

The purpose of many analytical engineering appraisals does not require an estimate of depletion, depreciation or income tax. There are, however, circumstances which require provision be made for these expense terms. In matters pertaining to the estimation of the value of oil and gas producing lands for tax purposes, the Bureau of Internal Revenue recognizes the validity of considering income tax as an expense.

What is the profit? . . . Operating cash profit, operating profit, and operating net revenue, are terms used to describe the money that remains in an oil or gas property account after payment of royalty, direct operating costs, production and mineral land taxes. Under certain circumstances, administrative and supervisory costs are deducted also. It represents the cash remaining before charge off for depletion, depreciation and income tax. It is the estimate of operating cash profit that is of primary interest to those who loan money and finance the purchase of oil and gas properties.

The reduction of estimated future operating cash profit to present worth is a feature of many analytical engineering appraisals. The discount rate should reflect the current use value of money. It should reflect the terms at which the owner or prospective purchaser of the interest being appraised could, on the date of the appraisal, borrow money. The Bureau of Internal Revenue and some governmental departments, however, do not so interpret the use of a present worth or discount factor.

Reference

1. D. L. Katz, "Development of Techniques in Reserve Estimation," A.I.M.E., Journal of Pet. Tech., Sept. 1953.

"It is not uncommon to find charges of $400 to $500 per month per drilling well made for the cost of supervision and administration. On producing wells, the rate will vary from $30 to $50 per well per month."

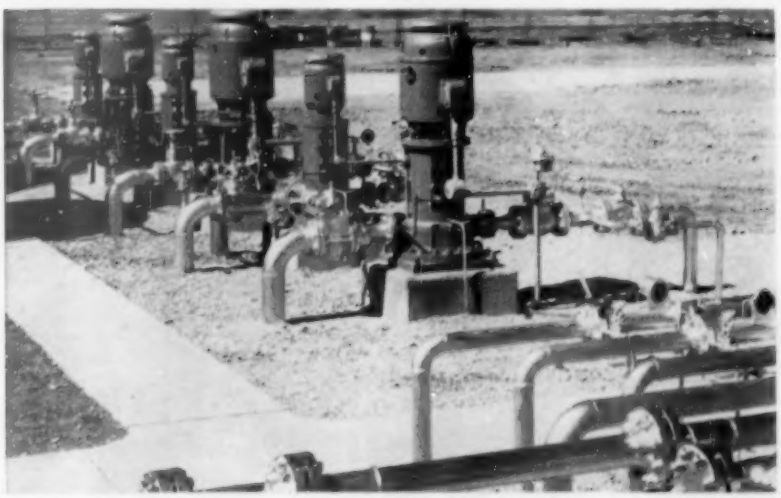
ATLANTIC REFINING'S Denton gasoline plant, located in Lea County, N. M., is designed to process 20,000 M.c.f. per day of gas, produce 150,000 gal. of liquids per day.

Here are the process design features of

Denton's New Natural-Gasoline Plant

by D. H. Henwood and C. P. Stanley

THE Denton gasoline plant, owned by 12 companies and 14 individuals, is located approximately 12 miles northeast of Lovington, N. M. This plant is a joint project for the conservation of gas and the manufacture of natural-gasoline products in which all of the operators in the pool have participated. The gas is gathered from 170 wells located on approximately 6,400 productive acres in Denton field. Wolfcamp production is obtained at approximately 9,400 ft. and Devonian at 12,300 ft.

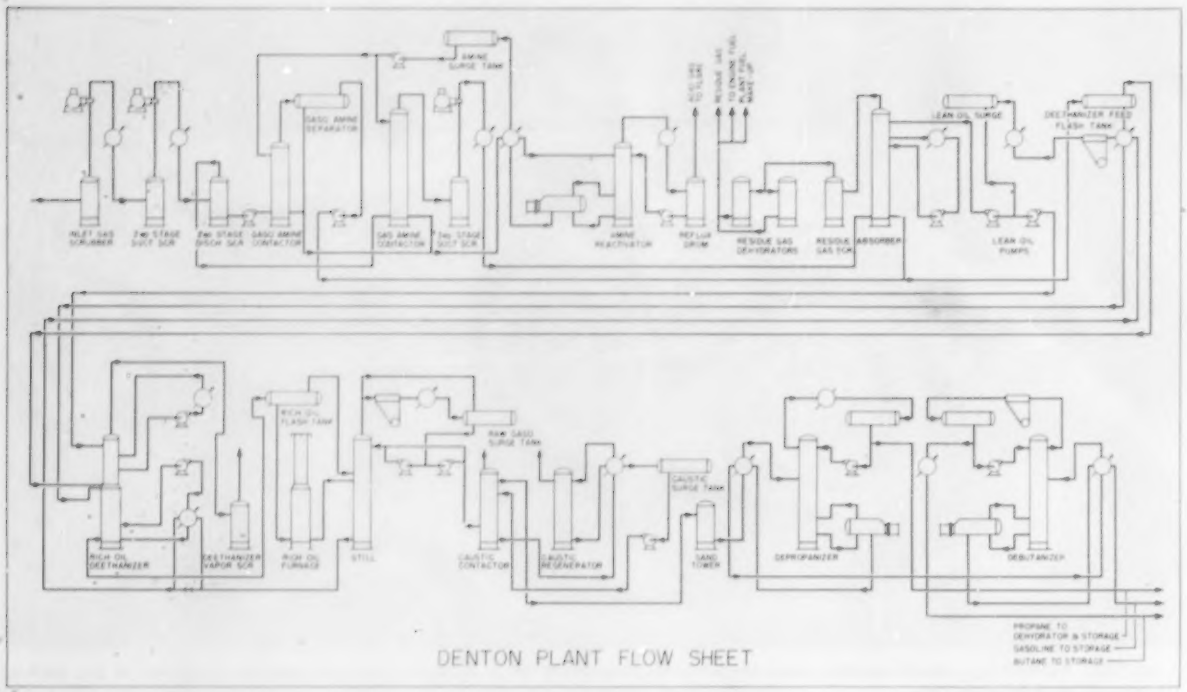


PRODUCTS PUMPS at Denton gasoline plant. In foreground is portion of control system which shuts down pumps when product flow ceases.

Participants in the Denton gasoline plant signed a construction and operating agreement effective January 15, 1953. This agreement named the Atlantic Refining Co. as operator of the plant.

The plant is designed to initially process 20,000 M.c.f. per day of gas which is brought to the plant by a low-pressure gathering system from tank batteries throughout the field. Production is scheduled as follows: propane, 52,417 gal. per day; mixed butanes, 52,241 gal. per day; and pentanes plus, 50,254 gal. per day.

Field gathering system . . . The field gathering system consists of some 15 miles of line ranging in size from 4 to 20 in. The system was sized for an operating pressure of 15 psig. on the lease separators and 10 psig. at the plant inlet scrubber. Gas from the two producing horizons is separately metered before entering the common col-



DENTON PLANT FLOW SHEET

lection system. Pipelines are protected by coal-tar enamel coating and are electrically isolated from the lease facilities by insulating flanges in the meter runs.

Plant Design Features

Compressors . . . The original compressor installation was made to compress 20,000,000 cu. ft. per day of gas from 10 to 850 psig. To accomplish this, five 1,100-hp. V-type units were installed, each engine equipped with two low-stage cylinders, one second-stage cylinder, and one high-stage cylinder. The compressor cylinders and clearance equipment have been sized for a variation in suction pressure from 4 to 10 psig. to allow the most advantageous use of the available horsepower with varying separator pressures and quantities of gas available.

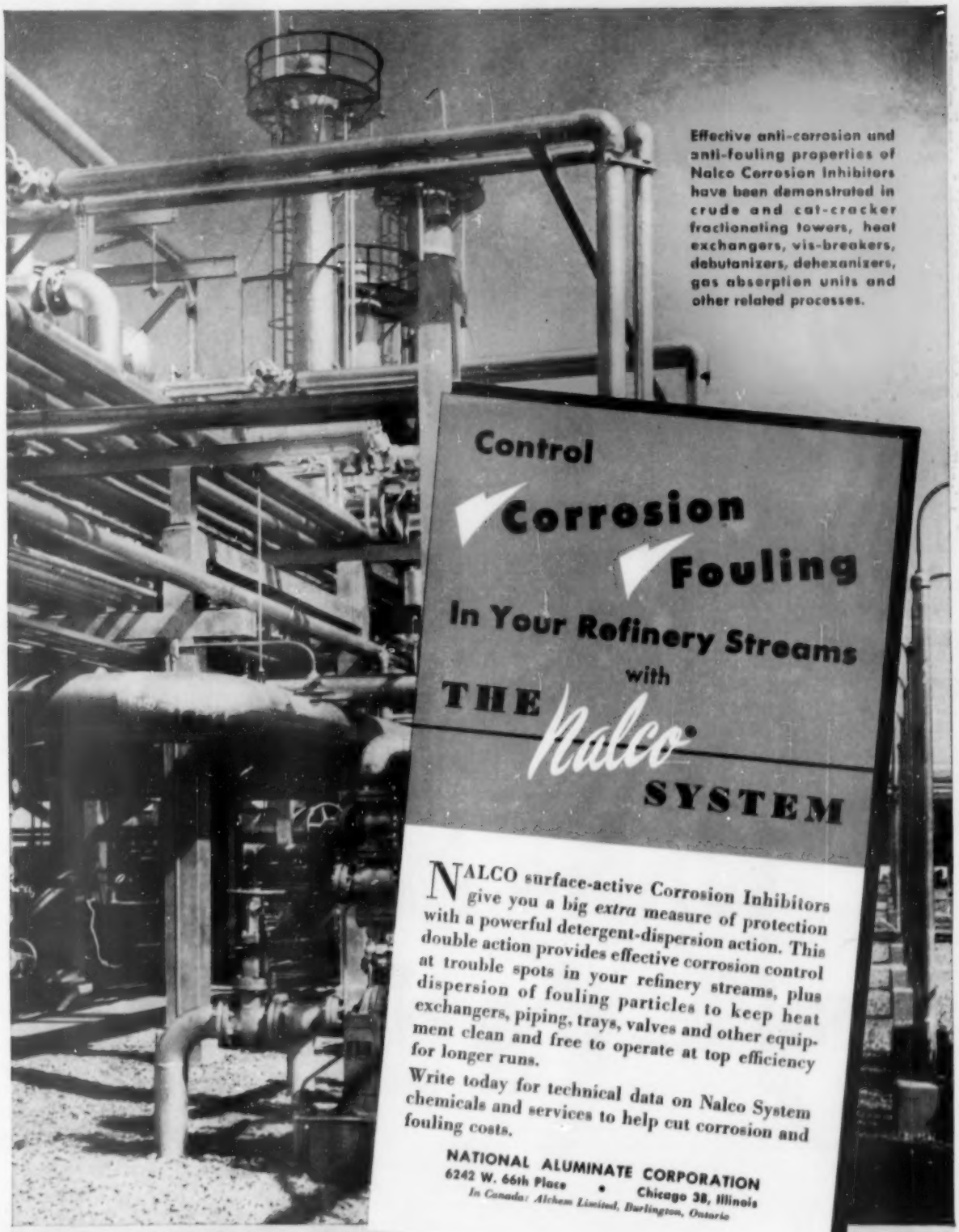
Gas treating . . . Gas and liquid from the compressor second-stage discharge are treated in separate contactors at 275 psig. pressure with 15 per cent amine solution. The inlet gas contains approximately 0.6 per cent H_2S and 2.6 per cent CO_2, requiring a total amine circulation of 131 g.p.m. The amine from these two contactors is combined to be regenerated in a 4½-ft.-diameter still packed with ceramic raschig rings. The amine circulating pumps are driven by steam turbines with the 85-psig. exhaust steam used for regeneration of the amine solution. Solution heat exchange, cooling, and reflux condensing for the amine still are accomplished in a conventional manner with shell-and-tube heat exchangers.

Absorption and distillation . . . After being treated for removal of H_2S and CO_2, the gas goes back to the third-stage gas compressors where it is compressed to a final discharge pressure of 850 psig. After cooling, this gas and condensed liquid then enters the base of the 4-ft. by 25-tray absorber, where it is contacted with 130 g.p.m. of 200 molecular weight lean absorption oil. The absorber is equipped with an external shell-and-tube intercooler, through which oil is circulated with a centrifugal pump. The intercooler tray has an automatic overflow so that if the pump goes down, the oil simply overflows to the next tray.

Oil from the base of the absorber, together with treated liquid hydrocarbon from the compressor second-stage

(Continued on page 114)

A PORTION of Denton's processing area. At center are amine treating and recovery vessels. At right is rich-oil deethanizer.



Effective anti-corrosion and anti-fouling properties of Nalco Corrosion Inhibitors have been demonstrated in crude and cat-cracker fractionating towers, heat exchangers, vis-breakers, debutanizers, dehexanizers, gas absorption units and other related processes.

Control Corrosion Fouling In Your Refinery Streams with THE Nalco SYSTEM

NALCO surface-active Corrosion Inhibitors give you a big *extra* measure of protection with a powerful detergent-dispersion action. This double action provides effective corrosion control at trouble spots in your refinery streams, plus dispersion of fouling particles to keep heat exchangers, piping, trays, valves and other equipment clean and free to operate at top efficiency for longer runs.

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Two semi-circular lubricant grooves surround each port to form a full circle. A semi-circular groove in the body surrounding one-half of a port is joined (when the valve is closed) by another semi-circular groove in the core, thus forming a complete circle. Moreover, in the Mission Plug Valve, no lubricant groove ever passes across a body port. The care and skill which Mission takes in machining these companion grooves is positive assurance that the Mission Line Pressure Lubrication Sealing System will always respond instantly to low or high pressure — gas or liquid, and will do so regardless of which end of the valve may be downstream. The advanced engineering and manufacturing principles practiced by Mission give you a superior valve thoroughly proved under all conditions. Specify Mission Plug Valves to your supply store. It's the **only** valve with automatic lubrication.

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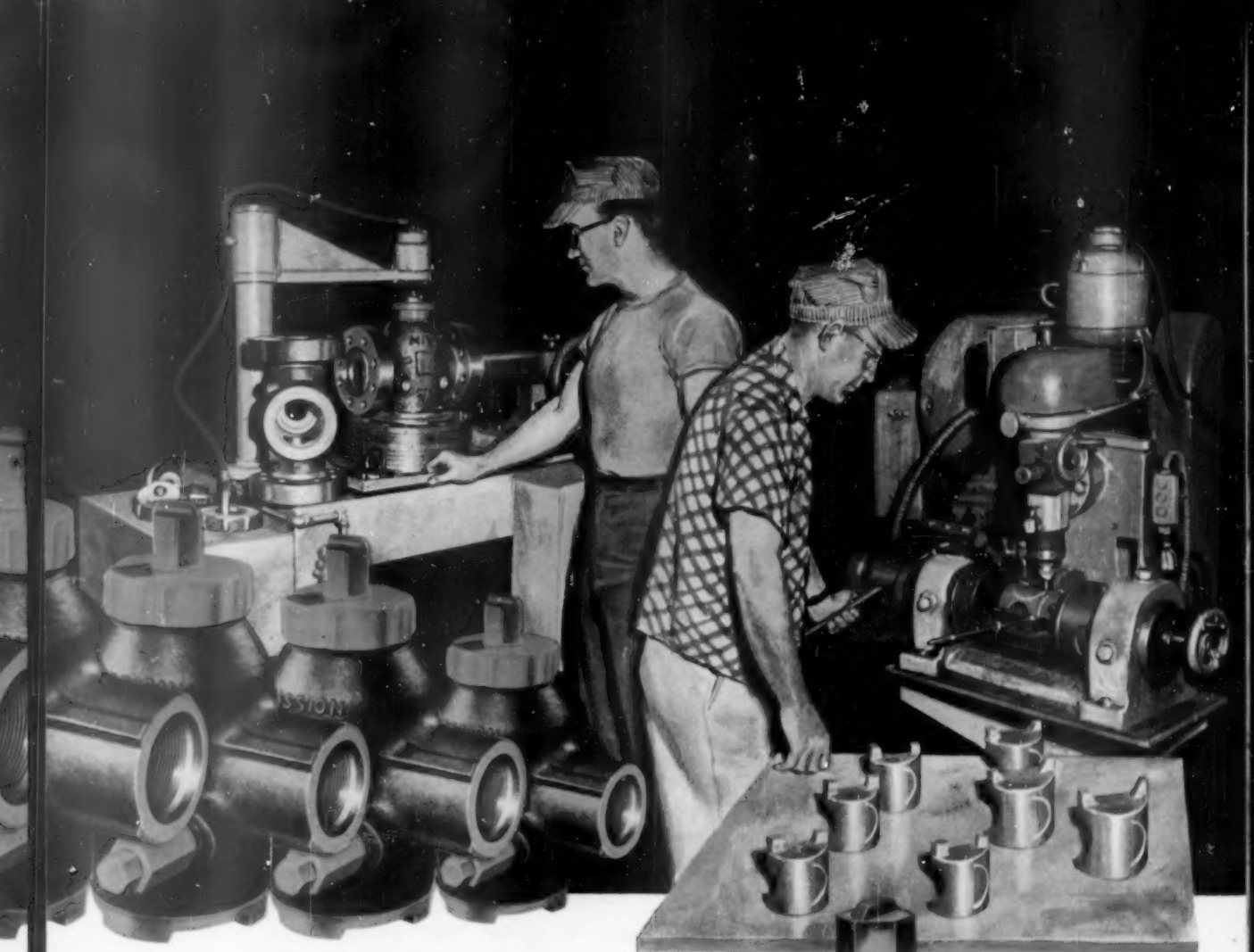

MISSION
MANUFACTURING CO.

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Export Office: 30 Rockefeller Plaza, New York

COMPRESSOR BUILDING houses five 1,100-hp. V-type compressors. At right is amine treater.

discharge, enters the deethanizer-feed flash tank. Vapors from this flash tank go directly to the rich-oil deethanizing tower, while rich oil from this tank goes through an oil heat exchanger before entering the rich-oil deethanizer. This tower consists of 45 trays and is designed to operate at 285 psig. Deethanization of the rich oil in this tower is accomplished by circulating 70 g.p.m. of lean oil to the top of the tower and adding heat to the base by means of oil heat exchangers, recovering the heat from the lean stripped oil from the still. The absorption section of the tower is equipped with an external intercooler.

The deethanized rich oil is flashed to 187 psig. with the vapors going directly to the still while the liquid is heated to 475° F. in a direct-fired furnace. The hot rich oil then passes to an 8-ft. i.d. by 25-tray still where the natural gasoline is stripped from the absorption oil using superheated steam as a stripping medium. The deethanized natural gasoline and stripping steam are totally condensed using air-fin cooling sections to cool to about 140° F. and are finally condensed in shell-and-tube units at 90° F. and 85 psia.

Fractionation and treating . . . The deethanized natural gasoline is treated for mercaptans in a liquid caustic contactor. Caustic is regenerated continuously by heating and stripping with steam.

Treated gasoline is depropanized in a conventional 5-ft. i.d. by 40-tray bubble-cap tower. The propane is dehydrated in a dry-desiccant-type unit before storing. The bottom product from the depropanizer is fed to a 5-ft. i.d. by 35-tray debutanizer where mixed butanes are produced as an overhead product and 26-psi. grade or debutanized gasoline can be produced as a bottom product. The 26-psi. grade gasoline is passed through a Perco sweetener before storing.

Debutanizer vapor is condensed with air-fin cooling and product cooling with shell-and-tube units.

Calculated production under summer conditions is as follows:

	Gal. per day
Commercial propane	52,417
Mixed butanes	52,241
Debutanized gasoline	50,254
Total	154,912

The estimated winter production based on the winter gas analysis and a 60° F. wet-bulb temperature is as follows:

	Gal. per day
Commercial propane	51,532
Mixed butanes	43,129
Debutanized gasoline	30,132
Total	124,793

THE AUTHORS

D. H. HENWOOD

C. P. STANLEY

D. W. Henwood is resident engineer for Atlantic Refining Co., Dallas, in charge of design and construction for Southwest. He has been in this position with Atlantic for 4 years.

C. P. Stanley is chief engineer for Dresser Engineering Co., Tulsa, a position he has held since 1947. He had previously been associated with Phillips Petroleum Co., at Borger, Tex., and at Oklahoma City and Bartlesville.

Gas dehydration . . . Residue gas is dehydrated in a conventional-type solid-desiccant dehydrator using low-iron calcined bauxite as a desiccant. Regeneration is accomplished by use of a gas sidestream which is heated in a direct-fired, salt-bath heater. Cooling of regeneration gas is done by heat exchange with the outlet gas stream.

Electrical and other services . . . Electric power is generated at 480 volts by three 450-kw. generators driven by four-cycle gas engines.

To conserve water, air-fin coolers are used for engine jacket-water cooling, still primary condensing, debutanizer reflux condensing, primary lean-oil cooling, and boiler makeup evaporator condenser.

Steam is furnished by two 36,000-lb. per hour, forced-draft, gas-fired, water-tube boilers.

Instrumentation of the plant is very complete, with instruments being centralized in three locations: in the compressor building; in the amine-treating area; and in the central process control room.

Product Delivery Facilities

Delivery of products may be made to a railroad loading rack on the outskirts of Lovington or to trucks at the plant site. In addition, there is a pipeline connection for natural gasoline. Products are pumped 11 miles directly to the 24-car loading rack. No storage is provided at the railroad siding. A three-spot truck-loading rack is provided, with the loading points dispersed so that loading may continue at one spot during truck movements at the other spots.

Fuel, primarily from the deethanizer, is returned to the producing leases, and dehydrated residue gas is delivered to an interstate pipeline at the plant limits.

Participants . . . The participants in the plant are: Atlantic Refining Co., Roy G. Barton, Cabot Carbon Co., Frank T. Fleet, Howard W. Fleet, Margaret Fleet Freeman, Silas H. Freeman, Forest Oil Corp., W. L. Goldston, Walter L. Goldston, W. J. Goldston, Gulf Oil Corp., J. H. Herd, Lawton Oil Corp., H. L. Lowe, R. H. Frizell, Jr., Magnolia Petroleum Co., McAlester Fuel Co., The Ohio Oil Co., W. C. Partee, Phillips Petroleum Co., John J. Redfern, Jr., Shell Oil Co., Sinclair Oil & Gas Co., and Skelly Oil Co.

Engineering design and construction of this plant was done by Dresser Engineering Co. of Tulsa, in cooperation with personnel of Atlantic Refining Co.'s engineering and construction, research and development, and operations departments.

The Phillips P4 well in the TXL Field near Midland, Texas, is producing 16 bbl of oil daily, from corrosive Devonian formation.

View of the P4 well-head equipment. Bethlehem "46" rods have been used in this well since mid-1949, without failure.

"46" Rods Give Good Service in 7800-ft Well Near Midland

More than five years of trouble-free pumping have been provided by Bethlehem Sucker Rods in the 7800-ft TXL P-4 well operated by Phillips Petroleum Company, near Midland, Texas.

Camera catches Jake Barbee, maintenance superintendent for Phillips Petroleum, making an office call.

This well has a string consisting of 1550 ft of 1-in., 1850 ft of ⅞-in., and 4400 ft of ¾-in. Bethlehem "46" rods (nickel-molybdenum). The well averages 16 bbl of oil daily. No water has been encountered.

Oil-field operators can always count on economy and dependability when they make up strings with Bethlehem Sucker Rods. Bethlehem rods are made of carbon and alloy steels. They are fully normalized, and come in five types, each designed for a specific kind of pumping duty. For detailed information about Bethlehem rods and accessories, get in touch with the nearest Bethlehem office or sucker rod distributor.

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BETHLEHEM, PA.

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BETHLEHEM *Sucker Rods*

BETHLEHEM STEEL

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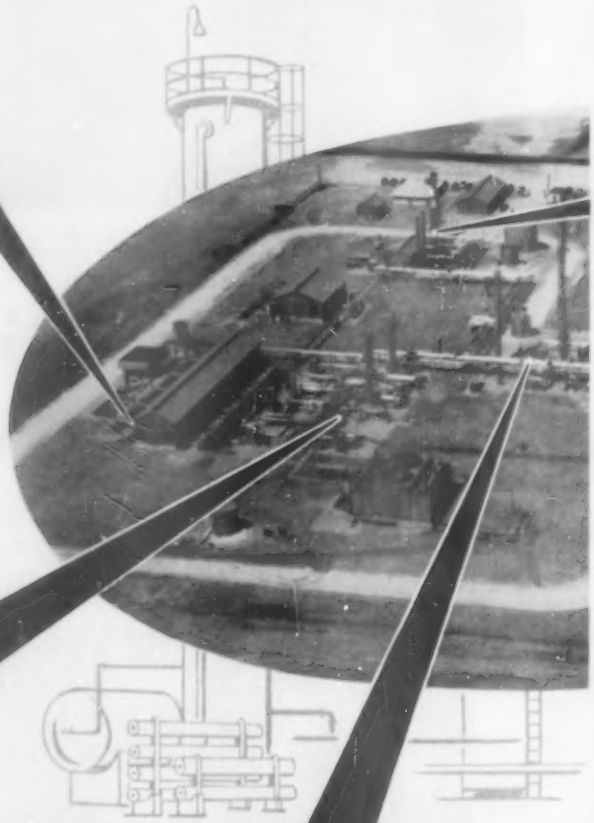
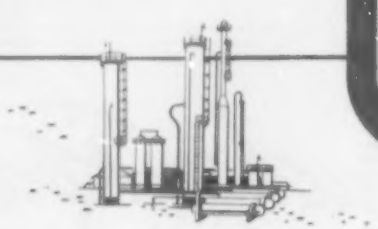
DRESSER ENGINEERING COMPANY specializes in handling a variety of petroleum processing projects FROM INCEPTION TO COMPLETION. The Denton Field Natural Gasoline and Liquefied Petroleum Gas Plant near Lovington, New Mexico — of which Atlantic Refining Company is the operator, is but one example. In this instance DRESSER handled the project from evaluation

COMPRESSOR BUILDING — The compressor installation uses five (5) 1100 HP engines to compress 20,000,000 cubic feet of gas per day.

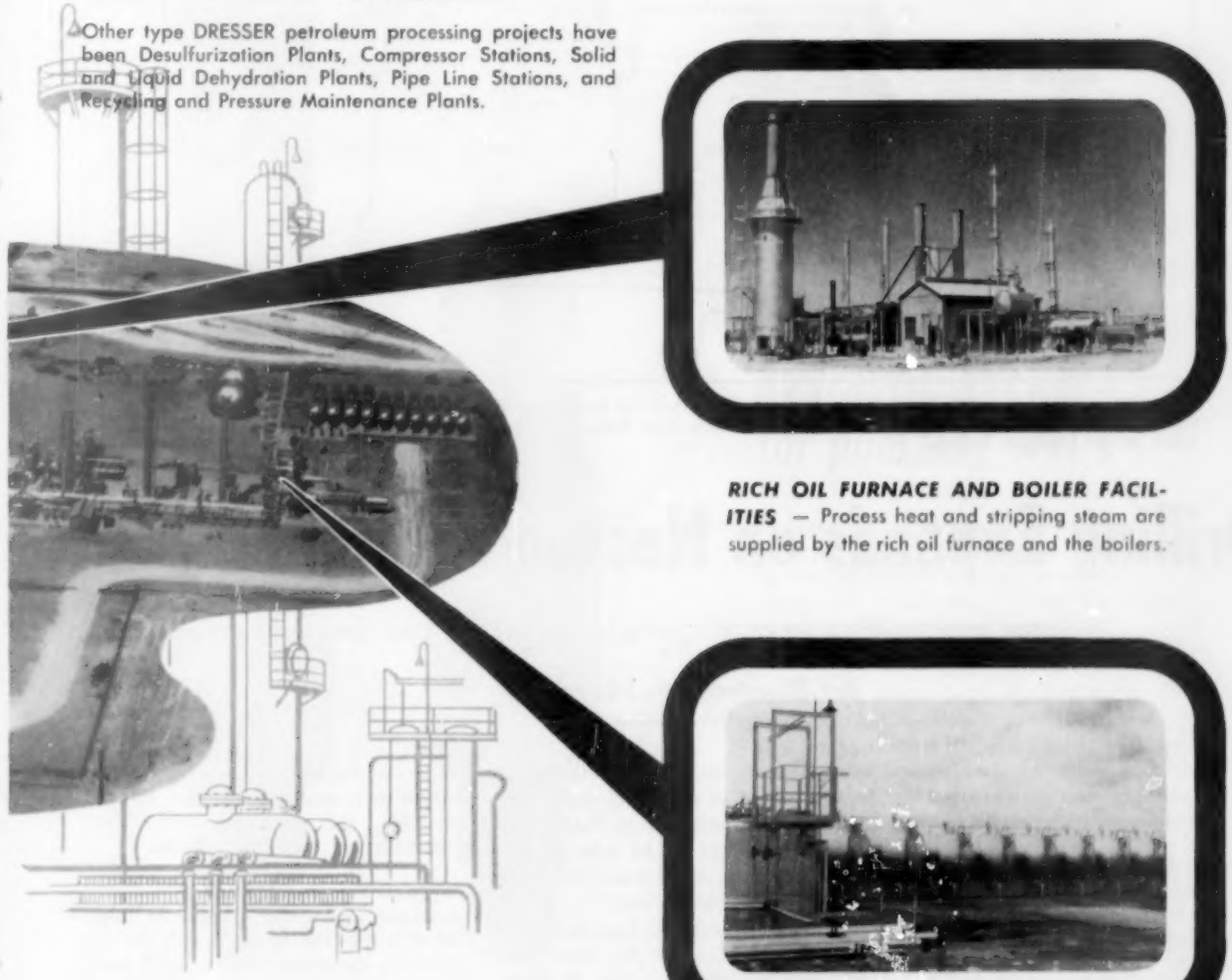


AMINE TREATING AREA — Gas and liquid from the second stage of compression are treated in two separate amine contactors. The amine from these two contactors is regenerated in a common still.



of processes through engineering design, purchasing and complete construction — ready for operation.

Other type DRESSER petroleum processing projects have been Desulfurization Plants, Compressor Stations, Solid and Liquid Dehydration Plants, Pipe Line Stations, and Recycling and Pressure Maintenance Plants.



RICH OIL FURNACE AND BOILER FACILITIES — Process heat and stripping steam are supplied by the rich oil furnace and the boilers.

ABSORPTION AND DISTILLATION • TREATING AND FRACTIONATING — Propane, Butane and Natural Gasoline are removed from the gas in the absorber, stabilized in the rich oil deethanizer, and stripped from the oil in the still. This raw gasoline is treated in a regenerative type caustic treating system and then fractionated into the desired products.

PRODUCTS STORAGE — Storage facilities include six 1,000 Bbl. propane storage tanks, four 1,500 Bbl. Butane storage tanks, and two 5,000 Bbl. gasoline storage spheroids. Total storage capacity — 924,000 gallons.

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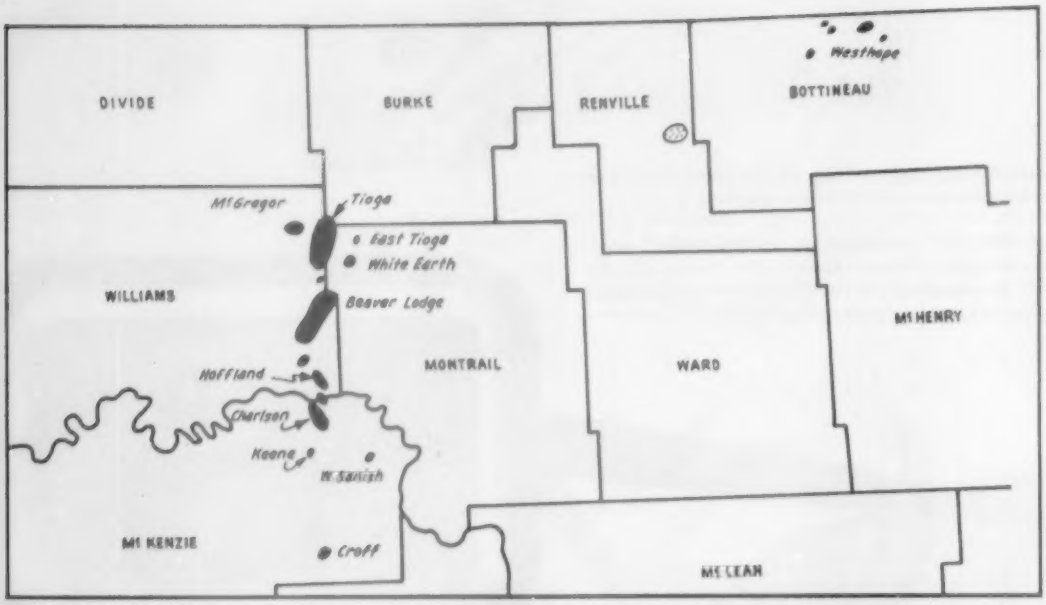


Fig. 1—Most of the oil production in North Dakota is from fields on the Nesson anticline such as Beaver Lodge and Tioga. Recent discoveries east and west of this trend at White Earth, East Tioga, and McGregor have extended production on the flanks of this important feature.

Drilling Expands on Nesson Anticline

Williston basin settling down to a long-range drilling and development program

by Norman S. Morrisey
Drilling Development Editor

THREE new fields in the Beaver Lodge-Tioga area have helped to step up drilling activities on the Nesson anticline, main producing trend in North Dakota.

Two of these fields, White Earth and McGregor, were discovered in 1954; East Tioga, a 1953 discovery, was brought in with the successful completion of Amerada Petroleum Corp. 1 C. Rice. All three fields produce from the Madison limestone, main reservoir in the large Beaver Lodge-Tioga trend.

Geology . . . The Nesson anticline is a prominent positive feature on the northeast side of the Williston basin and is reflected in the overlying Cretaceous beds. Oil was first discovered on this large regional feature by Amerada upon completion of the 1 Clarence Iverson. Since this famous well was brought in, development drilling on the trend has proceeded at a fairly rapid rate. At the present time there are 360 producers in North Dakota, the vast majority of them on the Nesson anticline.

During the past years, subsurface and seismic information has been piling up, and operators are beginning to cash in on this wealth of data. McGregor field, about 4 miles northwest of Tioga, is an excellent example of the value of subsurface control and the need for more well control in new areas.

Three dry holes had been drilled on the northwest flank of the Tioga pool, and individually none was of major importance. However, optimistic contouring clearly showed an anticlinal trend centered in Sections 5 and 6, 158n-95w. The W. H. Hunt 1 Gohrick was staked on this structure and became the discovery well for the pool. The well is producing from the Madison through perforations and was completed for an initial potential of 85 bbl. of 38.5°-gravity oil. On tests, the well flowed 137 bbl. of oil in 12 hours.

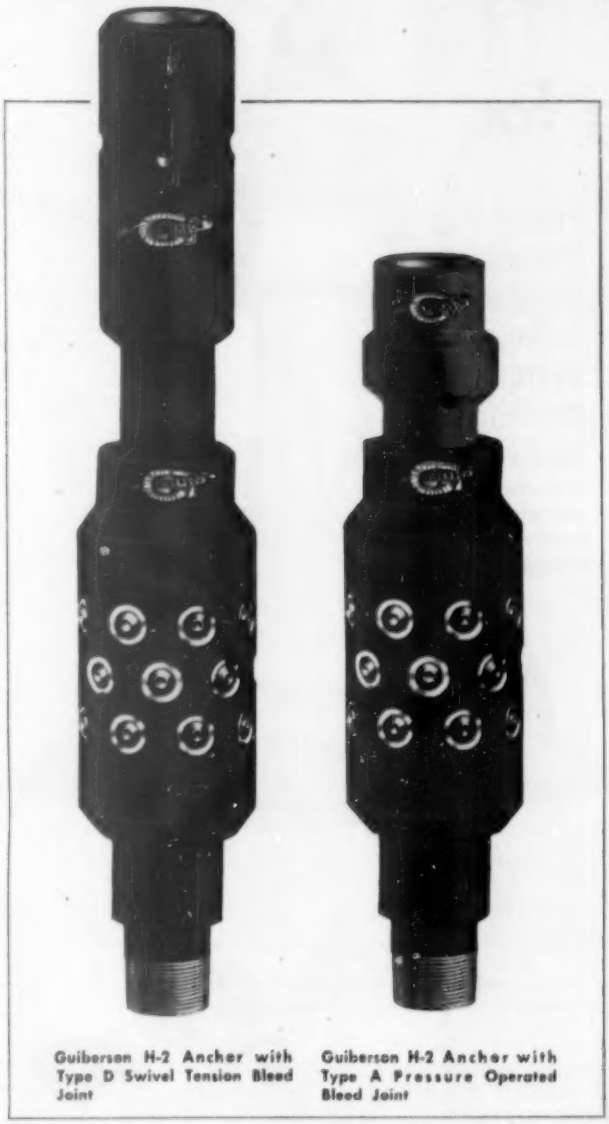
White Earth on the east side of the Tioga pool was discovered by Amerada with its 1 Lokken; this well was a Madison producer with an initial potential of 138 bbl. of oil from 10 ft. of perforations.

Both White Earth and East Tioga are very low-relief structures and may be part of the same positive trend. Although each field has less than 100 ft. of relief, the producing areas will eventually cover several sections.

Pay zone . . . The Madison limestone, producing reservoir in all three of these fields, is encountered at 8,050-8,200 ft. Wells are completed flowing or, if necessary, placed on the pump. The pay zone is similar to that at Beaver Lodge and Tioga, where the Madison produces from bedded porous and permeable limestones. Keplinger has shown that these zones at Tioga are continuous over a large area and that the reservoir probably has a combination gas and water drive for the source of its energy. It is quite probable that these new fields will have similar reservoir conditions.

In some fields in the Rocky Mountains, the Madison limestone production is spotty and erratic in its distribution, but generally speaking it is a prolific continuous reservoir. At Elk Basin in Montana and Wyoming, the Madison reservoir covers 5,400 acres and has produced over 11 million barrels of oil from 27 wells. Although the Nesson

STOP BREATHING



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Guiberson H-2 Anchor with Type A Pressure Operated Bleed Joint

Watch lift costs go down... production go up with

GUIBERSON'S H-2 *hydraulic anchor for pumping wells*

This anchor stops rod wear because it *stops breathing* — holds positively against all forces tending to cause movement of the string. Pump operation is more efficient — production is increased — lift costs are lowered.

Automatic action — no manipulation of tubing string is necessary with the H-2. As soon as fluid level in tubing is higher than casing fluid level, a series of *individual piston slips*, operating hydraulically and independently of each other, put a positive grip on the casing. Right from the start you save with the H-2 anchor. You save on first cost because the H-2 is exceptionally low cost. You save on crew time and money because the H-2 is reliable in operation — easy to set and release. You save wear and tear on your string — start lifting more fluid at lower cost.

TYPE D SWIVEL TENSION BLEED JOINT—Available in 2" or 2-½" tubing sizes. Either size shears with approximately 20,000 pounds tension at the joint. Ports in joint open when ring shears, allowing tubing to drain and thus release anchor.

TYPE A PRESSURE OPERATED BLEED JOINT — Available in 2" or 2-½" tubing sizes. Blow plug is available in 1,000 p.s.i. increments from 3,000 p.s.i. to 6,000 p.s.i. Plug ruptures when pressure differential reaches plug rating. Joints should be ordered rated approximately 1,000 p.s.i. above expected operating pressures.

Guiberson's H-2 anchor may be released by normal methods of equalizing tubing and casing pressures or with either of the above two bleed joints.

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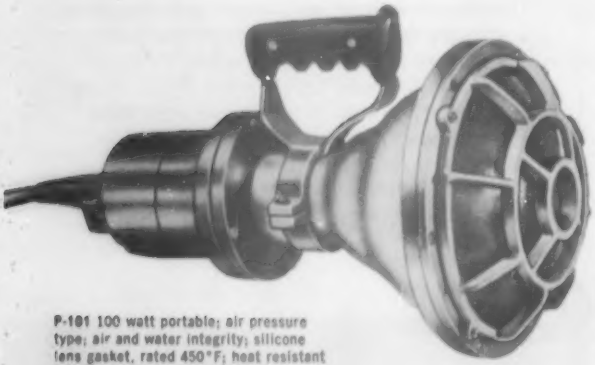

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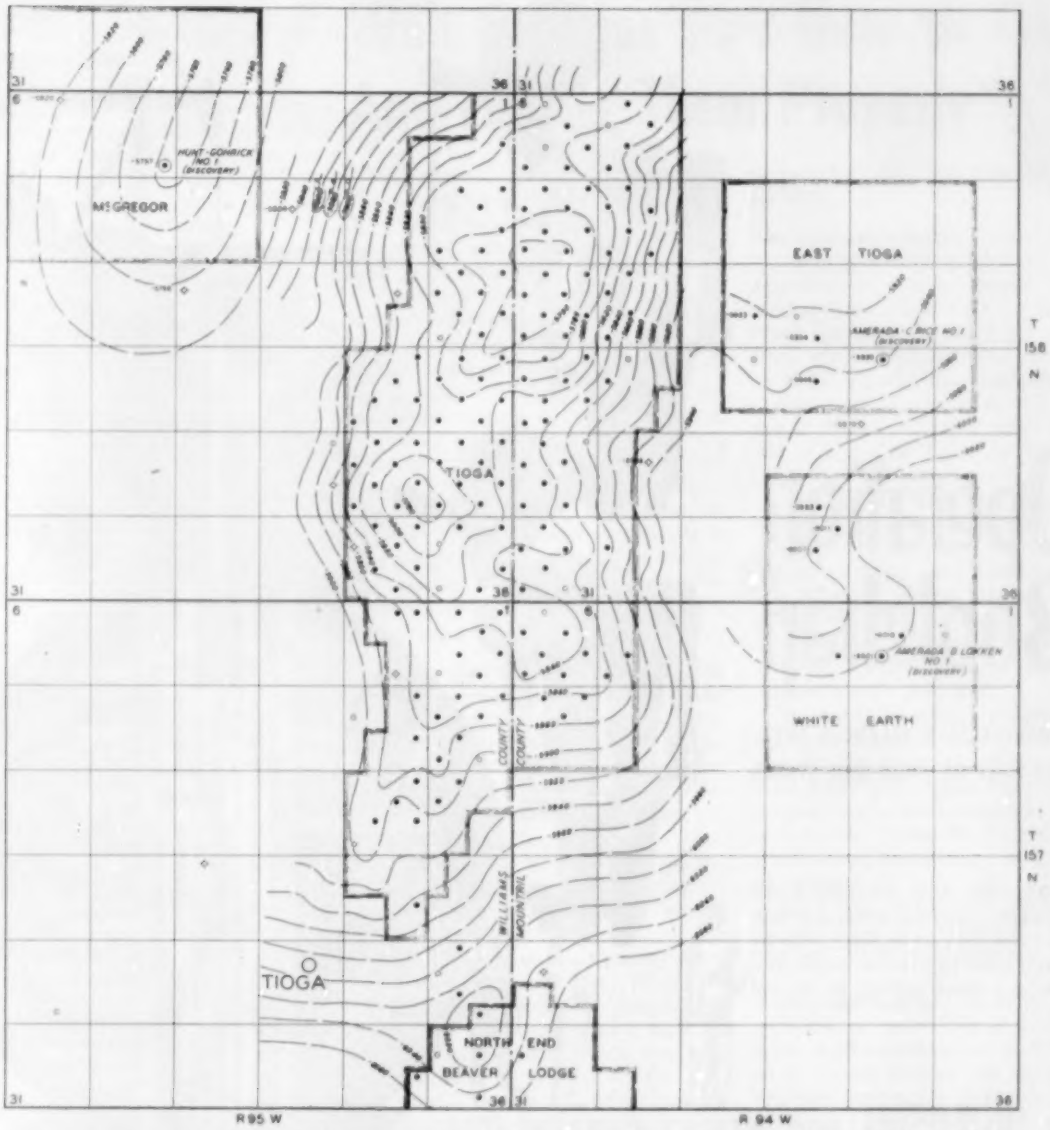


Fig. 2—Subsurface contouring outlined a promising lead in the McGregor area and led to the discovery of a new Madison field. (Subsurface data courtesy North Dakota Geological Survey.)

anticline wells have a thinner pay zone, the producing characteristics of the Madison compare favorably to Elk Basin and other Wyoming Madison production.

This means that the porous zones in the Madison limestone of the Williston basin probably are present over a large area.

Drilling . . . To date most of the drilling in these new fields has been on a day rate. Oil companies pay about $51,000 to the contractors for an 8,500-ft. hole, or approximately $6 per ft. This figure does not include the time spent in testing and completing the wells, for which contractors receive the usual day work rate.

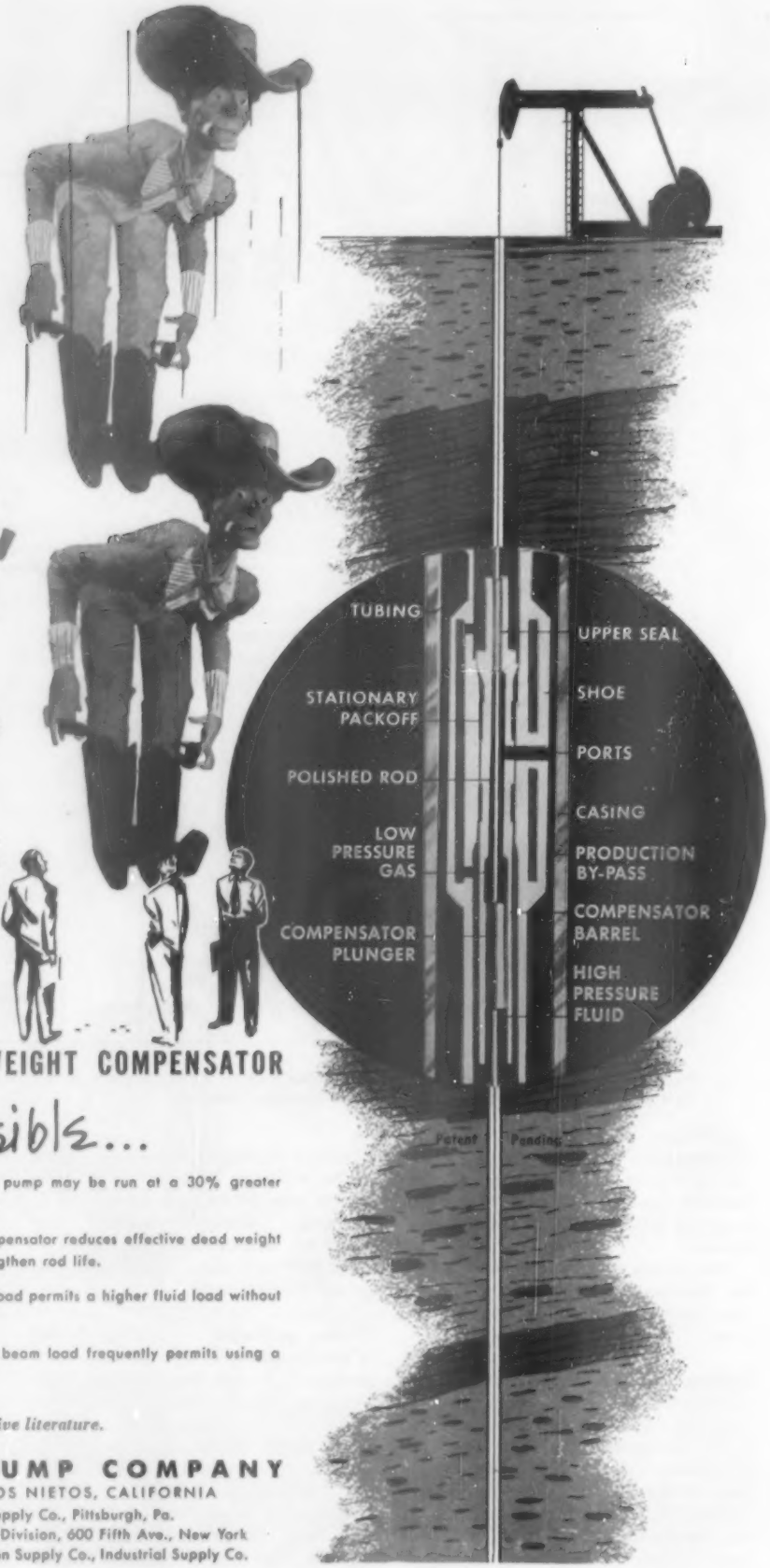
Because drilling is now fairly routine in the Williston basin, 8,500-ft. wells require only 30-35 days from spud to completion. Worley & Harrell completed the Amerada 1 Bokn in White Earth field in 26 days, including rigging up and tearing down.

Drilling problems . . . Two distinct lithologies on the Nesson anticline force contractors to use two kinds of muds while drilling in White Earth, East Tioga, and McGregor fields.

The upper section consists of Cretaceous sands and shales and is drilled with a native mud. The lower section is composed principally of limestones and shales interbedded with salt and gypsum. The Charles salt section overlies the Madison limestone and is 300 to 500 ft. thick. In the past, operators drilled the lower section with a gypsum-base mud. Recently they have turned to a salt-saturated mud because they are trying to prevent casing failure. Several field wells have had collapsed casing in the salt section and operators are currently trying to get at the cause of this expensive problem. Normal procedure is to change to the salt-saturated mud between 5,900-6,200 ft., at the top of the Piper limestone.

Several contractors have used jet bits to speed up drilling, but at the present time jets are not in common use.

Completion practices . . . Oil companies complete in the open hole and through



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perforations. The pay zone is usually treated with 2,000-3,000 gal. of acid prior to completion.

Outlook . . . Pessimists, lease brokers, and royalty owners are all shaking their heads about future developments in the Williston basin. Many of them look back on the past few years with an envious eye. However, drilling activity is on a par with 1953. The basin is settling down to a long-range drilling and development program. Oil companies are planning on carefully evaluating their leases through drilling deals, farmouts, and wildcat tests. The result of this program will be more fields like White Earth, East Tioga, and McGregor.

DRILLING REPORT
WHITE EARTH FIELD
Mountrail County, North Dakota

Pay zone	Madison limestone
TD (avg.)	8,200 ft.

Normal Rig Time Distribution

Days on day work rate	30-35
Total days (spud to rig release)	30-35

Bit Data

Total number of bits	27
Ft. per bit	310

Typical Equipment

Derrick: 133-ft. cantilever mast.
Draw works: National 80-U.
Motors (No. hp.): Three at 345 hp. each.
Pumps: One 7¾ by 18-in. and one 7¼ by 15-in.
Fuel: Gas or butane.
Nearest supply center: Williston or Tioga.
Terrain and roads: Rolling prairie; roads muddy in spring.

Casing Program

	O.D. (in.)	Casing Seat (ft.)	Cement (sacks)
Surface	10¾	622	525
Oil string	5½	8,200	750

Typical Mud Properties

Interval	600-5,900	5,900-7,000	7,000-TD
Type mud	Native	Sat. salt emulsion	Sat. salt emulsion
Weight (lb./gal.)		10.7	10.5
Filter cake (in.)		2/32	2/32
Viscosity (sec.)		51	60
Water loss (cc.)		9.0	9.1
pH		6.0	6.0
Salt content (p.p.m.)		291,000	312,000

Mud Summary

Average total mud costs are estimated at $7,287 per well.

Geological Data

Formation tops—	Depth (ft.)
Pierce	1,960
Greenhorn	4,315
Newcastle	4,740
Dakota	5,010
Morrison	5,400
Ellis	5,540
Piper limestone	6,080
Spearfish	6,300
Amsden	6,910
Kibbey	7,400
Charles salt	7,690
Madison limestone	8,200

Well Samples . . . How to Catch And Handle Them Properly

THE most important tool of the paleontologist is good well cuttings. Regardless of the individual's ability, the results are no better than the samples on which his work is based.

Poor samples appear to be due to lack of understanding on the part of those concerned with the catching of samples. An erroneous idea prevails that any material placed in a cloth bag constitutes a sample, even though it was taken from the slush pit. Ofttimes, great sport is made about the samples caught. There is the standard joke about the roughneck catching all his samples at once when he comes on tour. It is no joking matter to a company bearing the expense of maintaining its own paleontological staff or employing a consulting paleontologist.

Good samples essential . . . Since most drilling contracts contain a clause about catching samples, it is suggested that operators underscore that part of the contract and emphasize to the contractor that this is an essential part of his job. The following simple rules will insure good samples:

The first essential is a shale shaker, preferably the flat vibrating type. A wide board should be placed beneath the end of the shaker where the cuttings drop. When the required cutting interval has been attained (viz., 10, 15, or 30 ft.), samples may be scooped off this board with a shovel. Cuttings should then be placed in a box with an area of 1 to 1½ sq. ft. The bottom of this box should be screen. An abandoned shale-shaker screen is highly desirable. If none is available, then ordinary window screen will suffice.

After samples have been placed in the box, run water over them with a hose, occasionally stirring cuttings with one hand until all sand and soluble material have been removed. This washing must be done at the well while the samples are wet. Once the shale dries out, it begins to disintegrate when wet again and the fine shale particles and the "bugs," which are microscopic in size, pass through the screen. If the cuttings are not washed and stirred sufficiently and sand is retained in the sample, it will usually result in a voluminous sample for the paleontologist to look through. The bugs are in the shales.

Gulf Coast section, Society of Economic Paleontologists and Mineralogists special publication No. 1, September 15, 1954. Copyrighted by S.E.P.M. committee (Charles W. Stuckey, Jr., chairman; Jack O. Colle, J. M. Crosbie, and C. H. Strachn).

Label samples clearly . . . After sample is caught and washed, label dry sample bags with an indelible pencil, both on the bag itself and on the tag provided. Place sample in bag to drain and dry. They may be placed near steam line on steam rig and near the exhaust on a power rig. Once dried, the sample should be placed in a sheltered spot and kept dry until sent to the laboratory.

After sacking the sample, take a hose and wash the remaining cuttings from the board so that the next batch will be from the next cutting interval.

It is recommended that a large and a small bag of sample be taken, the large one to be eventually released to a cutting room and the small one for the company's own use.

In general, mud-logging samples have not been found to be satisfactory for paleontologic use. However, if prior arrangements are made with the mud-logging companies to collect larger samples and to follow the procedure outlined above, satisfactory samples may be obtained.

If for some reason a sample is missed, do not allow the roughneck to fill a bag with erroneous material.

Coring and logging . . . In the case of wire-line or conventional coring, the crew should continue to catch cuttings as in normal drilling. The geologist or engineer supervising the coring should sack up a portion of each core for the paleontologist, preferably the shale portions.

Prior to running an electric log, most operators circulate to condition mud for a period of time sufficient to get returns off bottom. Just before pulling out of hole, a sample should be caught, regardless of whether the cutting interval has been reached. This is often a critical sample.

In case of lost circulation where the shaker is cut out and lost circulation material has been added, the following method may be used. Anchor a 5-gal. bucket in the ditch. Remove bucket when about half full and fill with a hose, stirring material in bucket vigorously, and causing the lost circulating material to rise to top. Float off lost circulating material and place remaining portion in sample washing box. Proceed as mentioned before.

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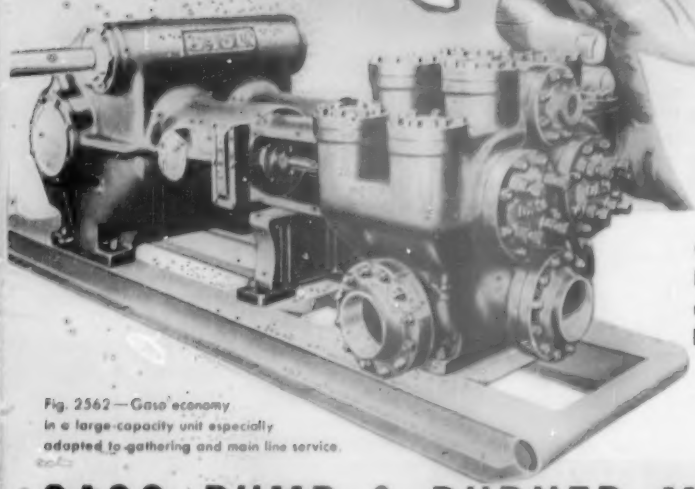

Fig. 2562—Gaso economy in a large-capacity unit especially adapted to gathering and main line service.

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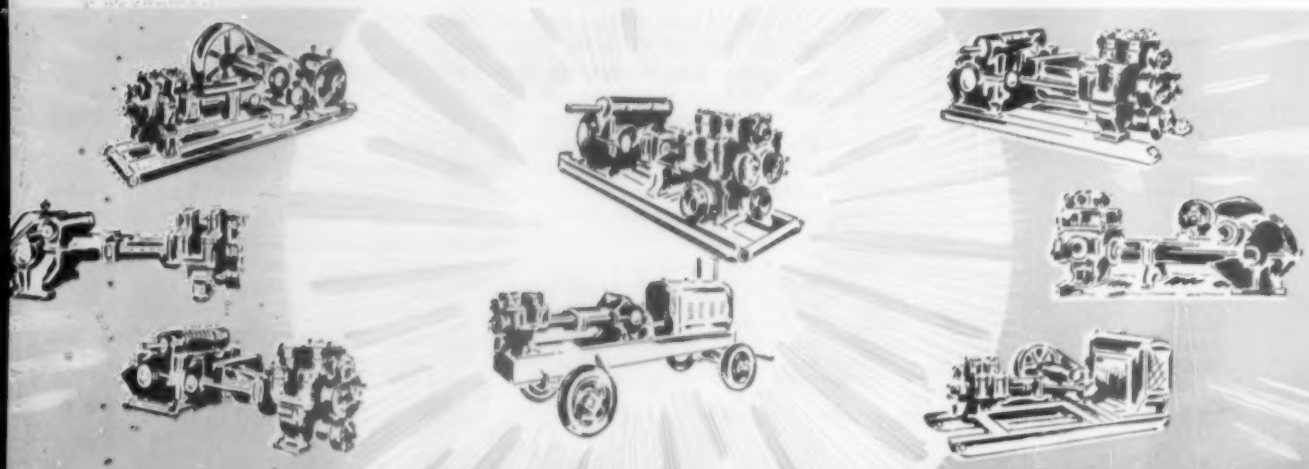


by William S. Worley

MODERN DRILLING

V-Belt Drives for Slush Pumps—1

THE petroleum industry has become more concerned about greater hydraulic horsepower, either through compounding the slush pumps or by use of pumps with greater hydraulic-horsepower rating. These improved drilling practices have required a serious reevaluation of the part to be played by the V-belt drive as the power transmission between engines and pump.

The V-belt drive has many characteristics which make it ideally adapted to the requirements of drilling service. These characteristics resulted in wide use of V-belt drives at the time when the drilling industry began to change from steam to internal-combustion power. Some of these characteristics are:

1. The horsepower rating of a V-belt drive closely parallels the horsepower output of an internal-combustion engine (Fig. 1).

2. The V-belt drive is dependable. Because it uses belts in multiple, the failure of a single belt does not incapacitate the drive. The remaining belts assume the load, and drilling can continue without costly interruption.

3. It is easy to erect and dismantle. It does not require precision alignment or adjustment.

4. It is clean. It requires no lubrication, no dressing, and no leakproof enclosures.

5. It requires little maintenance. Once the drive has been set up and the belts brought to operating tension, drive tension can be maintained with very few adjustments.

Author is with Gates Rubber Co., Denver. From a paper presented at Petroleum Mechanical Conference of A.S.M.E., Los Angeles, September 29, 1954.

The drilling industry has adopted application standards which are greatly at variance with published V-belt data. This has not been done formally; it has been done simply by general practice. Therefore, it is well to put on a quantitative basis the factors long recognized in a qualitative way as affecting the service given by a V-belt on a drive.

For example, it is well known that an increase in the power transmitted by a belt, other things being held constant, resulted in a decrease in the service life of the belt. Likewise, it is recognized that the diameters over which the belt operated affect belt life. The larger the diameter, the longer the belt life, other factors remaining equal. Belt length and belt speed were also known to be factors affecting belt life, with longer belts and lower speeds each resulting in increased belt life, with other factors being held constant.

A simplified analysis of the stresses to which a V-belt is subjected as it operates around the sheaves of a drive are shown in Fig. 2. This curve is taken for a plane of the belt above the neutral axis. It shows the instantaneous stress at each cross-section throughout the length of the belt. Point A is the midpoint of the span between the driver and driven sheaves on the loose side. Point B is the point of tangency on the driven sheave. Between A and B, the belt is subjected to stress from centrifugal force, T_c, and from the loose side tension, T_2, as indicated on the curve.

At B, the belt bends to the diameter of the sheave, and it becomes subject to bending stress, T_b, due to the fact that the plane we consider is above the neutral axis. Between B and C, which is the point of tangency on the tight side of the drive, the stress increases by the amount $(T_1 - T_2)$. At point C, before the belt leaves the sheave, it is under the combined stress from centrifugal force, T_c, bending, T_b, and the tight side tension, T_1.

From the point where the belt leaves the driven sheave at C, until it has bent to the diameter of the driver sheave at D, the stress due to bending has disappeared, and only the stresses T_1 and T_2 act on the belt. At the driver sheave, the stress pattern on the driven sheave is repeated in reverse, the stress decreasing between point D and point E by the amount $(T_1 - T_2)$.

Between E and A, of course, the stress is again $T_c + T_2$, just as between points A and B.

It is easy to see that each cross-section of the belt is subjected to a cyclic pattern of stress during each revolution. This pattern is characterized by a peak in the stress at each sheave, and the magnitude of the peak stress depends on the combined stress due to tight side tension, centrifugal force, and bending.

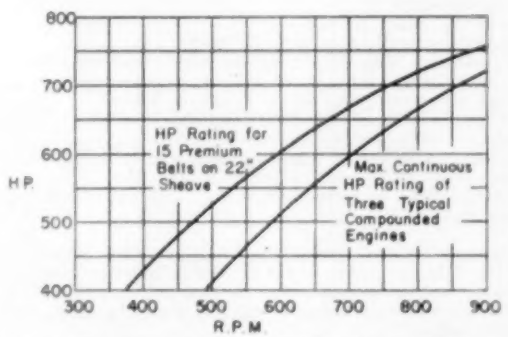


Fig. 1—Horsepower rating of a V-belt drive parallels horsepower output of an internal-combustion engine.

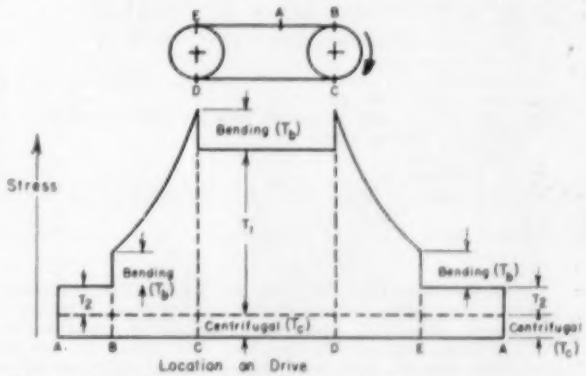


Fig. 2—Simplified analysis of stresses placed on a V-belt as it operates around the sheaves of a drive.

by W. L. Nelson
Technical Editor

PROGRESS IN METALS

Application of Metals and Alloys in Petroleum Refining

Part 2

THE application and services listed in this series summarize much of the material published on the Progress in Metals page since January 1953. The compositions of the various alloys or steels listed here were published in the form of an alphabetized list in the issues of September 14, 1953-January 4, 1954.

Any listing of applications will obviously be incomplete and note especially that the most common materials such as gray cast iron, malleable iron, carbon steel, ductile iron, brasses, bronzes, etc., are seldom listed even though they may be used more widely than alloys or alloy steels.

Equipment, Corrosive Agent or Service	Some of the Materials That Have Been Employed*†
Catalytic cracking:	
Elevator bushings	Ni-Hard iron
Linings or cladding	11-13 Cr steel
Reactors	18-8 stainless steel or 11-13 lining or cladding
Caustic soda	(See sodium hydroxide)
Caustic soda and mercaptans, regenerator or reboiler	Monel, Inconel or 2512 nickel steel
Cavitation, water pump	18-8 stainless impeller
Centrifugal (or rotary) pumps:	
Impellers:	
Reflux topping towers	Ni-Resist, Types 405 or 304 stainless, Cr-Ni iron
Refinery products	Cast iron, brass, bronze, Cr-Ni iron, etc.
Salt water:	
Impeller and casing	1.6 per cent Ni cast iron
Trim	Monel
Cold or hot water:	
Casing	Cast iron
Impeller and case, impeller and lantern rings	Bronze
Shaft sleeves	Monel
Cold refinery products:	
Casing	Cr-Ni iron or steel
Impeller and case, impeller and lantern rings	Cr-Ni iron
Shaft sleeves	No. 1 Stellite on 18-8 stainless
Hot refinery products:	
Casing	Steel
Impeller and case, impeller and lantern rings	11-13 chromium steel
Shaft sleeves	No. 1 Stellite on 18-8 stainless
Slurry pumps—most parts	11-13 stainless steel
Chain-links or bars	Q & T 1040, 2345, 3045, 3140, 4135, 4640, 5140 or 6135
Pins	Q & T 3245 and higher Ni-Cr steels; carb. 2512 steel
Chambers	(See vessels)
Clutch plates (engines)	Cr-Ni and Cr-Va cast irons
Coefficient (low) of expansion	(See instruments)
Coke handling and pulverizing	Ni-Hard cast iron, 11-14 Mn steel
Compressors:	
Aftercooler and intercooler tubes	Aluminum alloys or Alclad, carbon steel, etc.
Cylinder connecting-rod bolts	HT 4340 steel
Power cylinder—bolting, guides, crosshead shoe, rod, steam valve, and tappet	HT 3140 steel
Steam cylinders	Ni-Cr-Mo and Ni-Cr cast iron
Steam cylinders—pistons, heads, and steam manifold	Ni-Cr-Mo cast iron
Condensate (acid gasoline)	Cupro nickels, antimonial admiralty
Condensers:	
Ammonia and sulfide corrosion	Aluminum alloys
Coils or coil in box	Copper cast iron, plain cast iron, 2 Cr, 0.5 Ni cast iron
Coil headers	Ni-Resist cast iron, low alloy Cr-Ni irons
Gasoline, naphtha, and gas oil	Steel, admiralty metal, Cr or stainless steels, aluminum alloys
Hardware—bolts, nuts, screws, or rods for submerged condensers or cooling towers	Copper silicon manganese alloys (Everdurs), Monel
Stabilizer overhead	Steel, admiralty metal, aluminum alloys, etc.
T.C.C. overhead	Aluminum alloys, Alclad, stainless or Cr steels
Topping tower	Admiralty or antimonial admiralty, cupro nickel, Monel, aluminum alloys, etc.
Vacuum tower	Aluminum alloys or Alclad, carbon steel, Type 405 or 410 stainless steel

*Abbreviations—Type (302, 316, etc.) means A.I.S.I. designations. Q and T means "quenched and tempered." HT means "heat treated." Carb. means "carburized and case hardened." Numbers as 3140, 2335, etc., refer to S.A.E. steel designations. Chemical elements—C, carbon; Ni, nickel; Cr, chromium; Va, vanadium; Si, silicon; Mo, molybdenum; Mn, manganese.

†Obviously, plain carbon steel, cast iron, brass, etc., are used for most services and they will not always be listed. Likewise, many materials have been omitted because their use has escaped notice.

How to Design In-Tank Jet Mixing Systems—5

This installment is the introduction to a series of equations and nomographs which offer simplified methods of design procedure. All alignment charts referred to here will be presented in future installments.

A CALCULATION sheet for the design of in-tank jet mixers for general mixing problems will be given later. Following this sheet will allow rapid, straightforward determination of the factors needed for jet design: nozzle inclination angle; nozzle diameter; nozzle thrust; and total mixing time. An example is presented on the calculation sheet for illustration.

The following variables must be known for existing installations or be assumed for facilities in the design stage:

1. Blending-tank capacity.
2. Blending-tank liquid level.
3. Blending-tank diameter.
4. Circulating-pump rated capacity.
5. Circulating-pump rated head.
6. Specific gravity-tank contents.
7. Specific gravity - incoming stream.
8. Desired blending time.
9. Pipeline friction losses.
10. Static heads on the pump.

A. The first unknown to be determined is the most satisfactory **nozzle inclination angle.** This may be found with Fig. 3 knowing blending tank liquid level and diameter. This angle is not critical and if later calculations show that minimum head required to prevent stratification is not available for this determined angle, it may be increased. However, the minimum satisfactory angle should be used to allow the jet to be operated at low liquid levels without breaking the surface.

B. Now determine the **height of nozzle** in the tank. In an existing tank, the nozzle may have to be located in a position specified by present construction. The height of the nozzle should preferably be about 2 ft. from the bottom of the tank.

C. The **nozzle submersion** can now be found by subtracting the nozzle height from the maximum liquid level.

D. Next, using Fig. 9, the **specific gravity ratio,** $(p_2-p_1)/p_2$ must be determined, where p_1 is the specific gravity of the tank contents and p_2 the specific gravity of the incoming stream. If the lighter liquid is being injected into the more dense, use the value $(p_1-p_2)/p_1$.

E. Fig. 10 will then give the **minimum head to prevent stratification.** This head must be exceeded by the **net excess head** available at the nozzle, as calculated in F, if jet mixing is to be satisfactory. A reasonable safety factor should be included in this comparison.

F. The net excess head available at the nozzle must then be calculated. First, the pressure drop in the circulating-pump pipeline must be calculated. This may be done knowing the pipe sizes, flow rates, and total equivalent length of pipe, making allowance for all fittings, valves, etc., by the standard methods presented in handbooks. The total head consumed by the pressure drop and the static head at the pump discharge should then be subtracted from the total head available (the sum of the static head at the pump suction and the rated pump head) to obtain the **net excess head** that is available at the nozzle. This is the actual head that may be consumed by the nozzle in creating turbulence to mix the blending tank.

G. The **calculated mixing time** may be determined from Fig. 6. This is the time required for mixing a tank to a uniform condition. Since mixing occurs during any time a component is being added, it is not the time the tank must be circulated after the addition is completed.

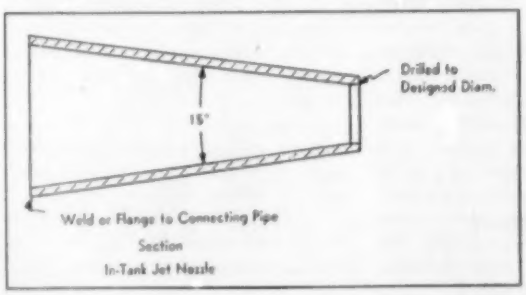
H. The **actual total circulating time** (including both time for addition and subsequent mixing) is equal to either the **calculated mixing time** or the **blending time** plus half of the **calculated mixing time,** whichever is greater. Tanks which are mixed continuously, such as rundown tanks, will be kept nearly homogeneous the whole time provided the calculated mixing time determined above is reasonably short.

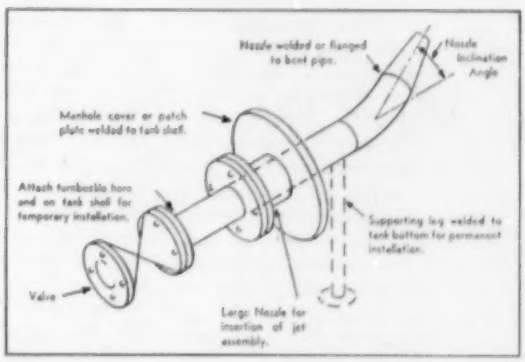
I. **Nozzle diameter** may be found with Fig. 7.

This material from E. I. du Pont de Nemours & Co., Inc.

Fig. 11 (below)—Design of sample nozzle.

Fig. 12 (right)—Sample installation sketch of a nozzle assembly.




Nozzle welded or flanged to bent pipe.
Nozzle Inclination Angle
Manhole cover or patch plate welded to tank shell.
Attach turnbuckle here and on tank shell for temporary installation.
Supporting leg welded to tank bottom for permanent installation.
Valve
Large Nozzle for insertion of jet assembly.

J. **Nozzle thrust** may be found with Fig. 8. This is the backward force exerted by the nozzle and must be absorbed by the nozzle supports. For liquids other than gasoline (sp. gr. 0.7), the nozzle thrust may be determined by multiplying the nozzle thrust from Fig. 8 by the ratio of the specific gravity of the incoming stream to the specific gravity of gasoline (0.7).

Installation . . . The installation of the jet nozzle in the blending tank is comparatively simple. The nozzle should be installed about 2 ft. from the bottom of the tank and directed diametrically across the tank to prevent rotational swirl. The nozzle may be fabricated by welding or casting. The nozzle diameter should be accurate. The piping and nozzle would have reasonably smooth internal surfaces so as to create as little friction as possible, and the angle of reduction in the nozzle should be about 15°. A drawing of a sample nozzle is shown in Fig. 11. A sample installation sketch of the nozzle assembly is shown in Fig. 12.

Note that the nozzle may be connected to the bent piping either by flanges or by welding, and that the assembly may have to be supported to absorb the backward force (nozzle thrust) created by the jet. It is also desirable to put a strainer in the pipeline ahead of the nozzle assembly to eliminate the possibility of plugging the nozzles with a large object.

An additional inlet should be provided on the tank so that the tank may be filled to operating level before the nozzle is used. If this is not done, discharging a high-velocity stream of gasoline through the jet into an empty tank might result in damage to the tank or structural members.

Explosion and fire hazards in vapor spaces of blending tanks are comparable for jet and conventional mixing systems.

Improving Diesel Fuel Quality

BY about 1941, medium and high-speed diesel engines had begun to find their place among the important power-producing equipment in the United States. It was not until after World War II, however, that a really remarkable increase in the use of diesel power started. This increase can best be illustrated in the language of the petroleum industry by the diesel-fuel consumption figures for several years. This consumption increased threefold from 1946 to 1953 alone.

Diesel fuel is not the only middle-distillate product that has been experiencing an increased demand, however, since furnace oils and jet-engine fuels also are taking a larger and larger share of the petroleum barrel. The demand for total middle distillate has been increasing at a more rapid rate than that for gasoline. The demand for diesel fuel has increased at a rate of about three times that for gasoline.

During this same period that the middle-distillate demand has been increasing, an equally remarkable change has been going on in petroleum refining. In order to meet the increasing demand for high-octane fuel by today's modern gasoline engines, catalytic cracking facilities have expanded to where they now represent a capacity of over 30 per cent of the total crude-refining capacity in the United States. Furthermore, some of the best feed stock for these catalytic crackers come from the straightrun middle-distillate portion of the petroleum barrel.

The net result of these factors has been to decrease the relative amount of straightrun middle distillates available for use as diesel fuels, and this trend shows every sign of continuing. An ever-increasing percentage of the middle distillate available for use as diesel fuels, furnace oils, jet-engine-fuel fractions and range oils must, therefore, necessarily consist of products from the cat crackers.

One outstanding characteristic of catalytically-cracked middle distillates is that they are generally lower in ignition quality or cetane number than the straightrun middle distillates obtained from the same crude source. Since most users of diesel fuel specify some minimum cetane number in purchasing this product, it is becoming more and more of a problem for some refiners to meet their customers' requirements as the straightrun material available for this use falls below their potential market volume for the fuel.

From paper by E. A. Desmond and G. C. Wilson of the Ethyl Corp., presented at W.P.R.A. meeting.

Diesel ignition improver . . . It appeared from surveys made that the availability of a diesel ignition improver would be most desirable to assist refiners in meeting the cetane number requirements of their customers. An investigation of over 300 compounds that were thought to have possibilities as cetane improvers disclosed that primary amyl nitrate was the best additive of all these from several standpoints including cost-effectiveness. One of the most significant characteristics of the compound is the high boost obtained with the first small percentages added to the fuels.

It was well known, of course, that secondary amyl nitrate previously had been investigated to some extent as a cetane improver. Two immediate advantages of the primary compound over the secondary are the greater effectiveness at low concentrations and the increased stability, both neat and when blended with a fuel.

It was expected from its composition that there would be few, if any, problems associated with the use of primary amyl nitrate in diesel fuels since it is made up of carbon, nitrogen, hydrogen, and oxygen—four elements already present in a fuel-air mixture. However, in introducing a new additive of any type, a long period of testing of many factors is necessary to verify its effect on fuels and engines.

Conclusions . . . From the extensive studies made in connection with the development of a diesel-ignition improver, the following conclusions have been drawn:

1. The use of amyl nitrate where required will increase the supply of good-quality diesel fuels by restoring the cetane numbers which are lost through modern refinery operations.

2. Properly utilized, amyl nitrate can permit added flexibility in refinery operations and result in savings where consolidation of facilities can be made possible for diesel fuels and furnace oils.

3. The chemical and physical properties of amyl nitrate are such that no health, safety, handling of materials problems are incurred by its use.

4. In normal operation of diesel engines, cetane numbers gained with amyl nitrate compare favorably with natural cetane numbers.

5. The use of amyl nitrate in diesel fuels does not aggravate engine operating or maintenance problems.

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Drilling Contractors

New Company Formed to Drill in Tri-State Area

Stouder Drilling Co. is a newly formed company operating in the tri-state area of Illinois, Indiana, and western Kentucky. Principal owners are R. E. Stouder, of Evansville, Ind., and Thurston Cooke, of Louisville, Ky. Charles Abernathy, Henderson, Ky., is tool pusher, and G. J. Hennessy, geologist. Main office is at Evansville.

The company is starting with two rotary rigs acquired from Westfall & Johnson, who are dissolving partnership as independent operators and contractors.

Hinkle Drilling Co., Houston, has taken a contract for a deep test to be drilled in George County, southeastern Mississippi. Location is for 1 Green, a wildcat in 37-1s-8w, 3 miles southwest of Merrill. Hole is scheduled to go to 13,000 ft. for a look at Lower Cretaceous horizons.

Fortenberry Drilling Co., Natchez, Miss., has a rig running for J. Paul Ratliff, Jr., of New Orleans, on a wildcat location, 1 Geohegan, in 12-8n-1e, 2½ miles north of Sunnyside field, in Jefferson County, southwestern Mississippi. It is a Wilcox test.

Kerr-McGee Oil Industries, Inc., Oklahoma City, will drill another test for Pure Oil Co. in the latter's Vermilion Block 39 area, in the Gulf of Mexico, 9 miles off the coast of Vermilion Parish, Louisiana. The test, 2-B State Lease 870, northeast of production, will be drilled from a surface location in Block 38. Bottom will be in the adjoining Block 23, to the north.

Oil Production Maintenance Co., Houston, is drilling for Panuco Oil Leases, Inc., and Michel T. Halbouty at a wildcat location 4 miles northwest of Anahuac, in northern Chambers County, Texas Gulf Coast. The test is 1 Lawrence, in Joseph Lawrence Island League. Contract is for 9,000 ft.

Miller & York, Bakersfield, Calif., is scheduled for a 5,000-ft. wildcat test to be drilled for Intex Oil Co. in the Paso Robles area, in northwestern San Luis Obispo County, California. Location is for 62 Kuhnle, in 12-26-12. Another new operation by Miller & York is for G. R. Nance at a wildcat location, 1 Intex Movius USL, several miles east of Kern Front field, north of Bakersfield, in Kern County.

Falcon Seaboard Drilling Co., Tulsa, is drilling for Sinclair Oil & Gas Co. at a wildcat location east of Colorado Springs, in El Paso County, Colorado. It is scheduled for a 7,500-ft. test. Location is at 1 Lewis, in 2-14s-65w.

Kern-Trimble Drilling Co., Magnolia, Ark., is starting another test for Roy Lamb and A. G. Galt, of Dallas, on their wildcat block 2 miles southeast of Oak Grove, in southeastern Kemper County, eastern Mississippi. Location, 1 Smith, in 1-9n-17e, is about ¾-mile east of the first test, 1 Phillips estate, recently abandoned at 4,575 ft. The new test is projected to 3,000 ft.

Balderson-Denver Drilling Co., Denver, has a new wildcat operation under way for Frontier Refining Co. in southwestern Logan County, northeastern Colorado. It is at 1 Frasco, in 4-7n-55w, 4 miles northwest of Willard.

Al Buchanan Drilling Co., San Antonio, is drilling for Stanolind Oil & Gas Co. at 1 Carlson, a new 9,000-ft. wildcat test in the Landa area, 6 miles south of Donna, in southern Hidalgo County, Rio Grande Valley area of Texas.

Webster Drilling Co., Tulsa, is starting a wildcat test for Shell Oil Co. in northern Cleveland County, Oklahoma. Location, at 1 Jones, in 12-10n-3w, is northeast of Moore, and southwest of the southern end of Oklahoma City field.

Clark Drilling Co. has contracted for a 4,500-ft. wildcat test to be drilled for Utah Southern Oil Co. and others in the Snowville area, of Box Elder County, Utah. The test is carried as 1 El Royale, with location in 23-14n-10w.

Sunnyland Contracting Co., Rayne, La., has scheduled a 5,600-ft. Eutaw test to be drilled for Walter E. Sistrunk, of Jackson, Miss., at a wildcat location

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a mile south of Yellow Creek field, in Wayne County, eastern Mississippi. The contractor will use a rig which has been on contract on a field well.

Glasscock-Wilson Drilling Co. is contractor on a new wildcat operation in northeastern Beauregard Parish, Louisiana. The test, 1 Texas Cresoting, is being drilled for Bates & Cornell, of Lafayette, La. Location is in 36-2s-7w, 11 miles east of DeRidder.

J. C. Trahan, Shreveport, will drill a 6,800-ft. Travis Peak test for Natural Gas & Oil Corp., also of Shreveport, at a wildcat location 2¾ miles west of Longstreet, in northwestern DeSoto Parish, Louisiana. Location is near the state line, about 4 miles east of nearest production in Carthage field, Panola County, Texas.

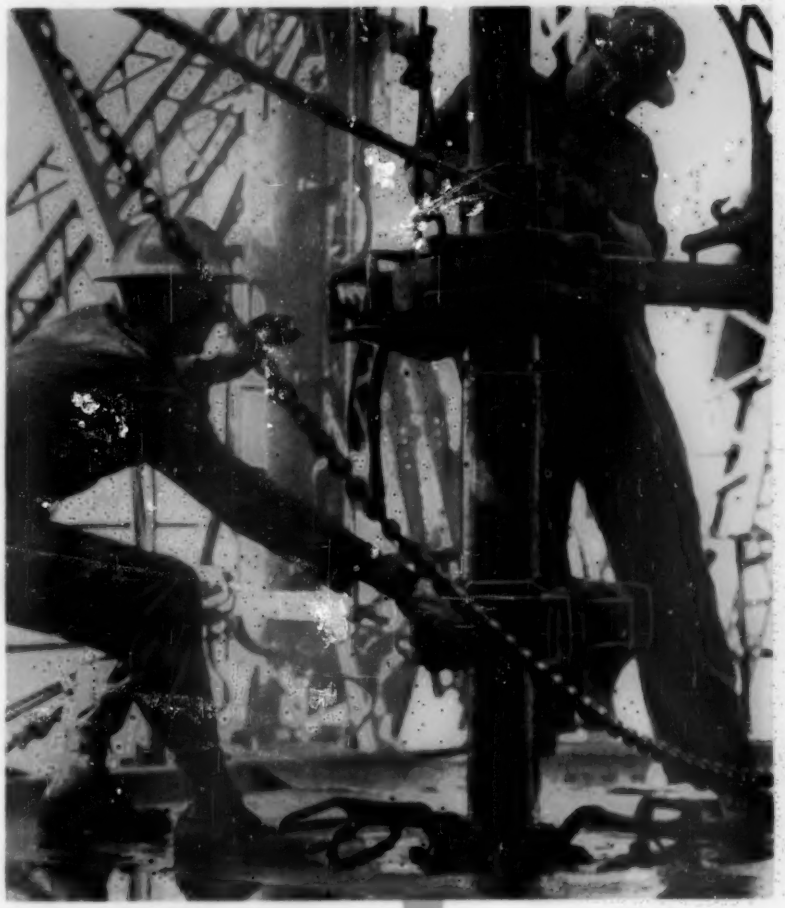
S. & O. Drilling Co. is contractor on Marshall Young's second test on his wildcat block southwest of Blaine, in Sunflower County, northwestern Mississippi. The new operation, 1 Parker, is in 18-20n-3w, about 3 miles west of the operator's first test, recently abandoned. Contract is for 4,500 ft.

K & H Drilling Co. is drilling for Watson Joyes, of Tulsa, and M. P. Evans, of McAllen, Tex., at a wildcat location southeast of Paden, in Okfuskee County, Oklahoma. The test, 1 Replogle, in 27-12n-7e, is projected to the Wilcox sand around 4,700 ft. Location is more than 2 miles from production.

Woolf & Magee, Tyler, Tex., will drill a 6,500-ft. Wilcox test for Serio-Punches Oil Co., of Natchez, Miss., at a wildcat location 3 miles north of Horseshoe field, in Concordia Parish, eastern Louisiana. Location is for 1 Calvert, in 24-7n-7e. It is 2½ miles southwest of Stacy.

Crow Drilling Co., Inc., Shreveport, has contracted for a 6,000-ft. Wilcox test to be drilled for Gauthier & Heard and W. L. Billups, of Natchez, Miss. It will be drilled as 1 Miller, with location in 1-8n-9e, about 1¼ miles northwest of Wilcox production in Clayton field, Concordia Parish, eastern Louisiana.

Rowan Drilling Co., Houston, is moving a rig to a wildcat location 15 miles southeast of Kenilworth, in St. Bernard Parish, Southeast Louisiana, where it will drill a 10,500-ft. test for Houston Oil Co. of Texas. The test is listed as 1 Biloxi Marsh Lands. Location is in 26-14s-16e.



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The recent expansion program at the Shellburn Refinery of the Shell Oil Company of Canada, Limited, has been completed by The Fluor Corporation of Canada, Ltd., a subsidiary of The Fluor Corporation. Capacity of the refinery was raised to 15,000 barrels daily by revisions to the distilling and thermal cracking facilities, and by adding a vacuum flashing unit, a fluid catalytic cracking unit, polymerization and auxiliary treating facilities, a gas recovery plant, and other related equipment. Engineered and built by Fluor, this job is typical of the top quality engineering and construction work done by Fluor on similar projects all over the world.

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REFINING

Coke Investigated

S.O.D. looking for new uses for fluid product

NEW YORK.—Standard Oil Development Co., an affiliate of Standard Oil Co. (N. J.), is investigating new fuel and metallurgical end uses for fluid coke.

A paper presented last week at the New York section meeting of American Institute of Chemical Engineers noted that the largest end use for fluid coke is most likely to be as fuel in boiler furnaces.

Authors Frank T. Barr and C. E. Jahnig of Esso Laboratories, S.O.D., reported on burning characteristics of the new product when fired as in conventional boiler pulverized fuel furnaces. Low ignition and burning rate of fluid coke can be adequately cared for by employing an auxiliary fuel and by grinding the coke to the proper size. About 15 to 30 per cent auxiliary fuel has been found to bring coke up to ignition temperature and to maintain a stable flame.

Because of its nature, grinding costs are relatively high for fluid coke, running approximately 2½ times the cost of grinding conventional boiler-furnace bituminous coal, or 60 cents per ton as compared with about 25 cents per ton for coal. Grinding costs may be balanced against loss in unburned carbon to give an optimum-cost picture. Even with a 10 per cent unburned carbon loss, fluid coke with a heating value of about 14,000 B.t.u./lb. will compare favorably with run-of-the-mine coal, the authors reported.

Other uses . . . Other possible uses include carbon electrodes, manufacture of calcium carbide, phosphorus, and carbon disulfide, and possibly as metallurgical coke. The latter market, because of its size, is of particular interest.

In preliminary tests, fluid coke has shown improved characteristics over byproduct coal-coke breeze or anthracite fines as a low-volatile or inert constituent in the charge to a byproduct coking oven. The U. S. Bureau of Mines has indicated that fluid coke improves size and reduces shatter loss of product coke used in blast furnace and foundry operations. United States consumption of such metallurgical coke runs 70,000,000 tons per year, and even a small percentage of petroleum-coke blending would amount to a sizable new market.

Development work is going forward on methods for desulfurizing and calcining fluid coke, but it is still too early to determine what progress might be expected from such studies. Pelletizing and briquetting techniques are also being developed.

Annual Sinclair Safety Symposium Completed

The sixth annual Sinclair safety symposium attended by Sinclair Refining Co., Sinclair Research Co., Sinclair Pipe Line Co., and Richfield Oil Corp. was recently completed at Independence, Kans. The symposium is held each year to analyze the safety policies and records of Sinclair Refining Co.'s refineries. Attending were, front row (left to right): D. F. Wilson, M. J. Neterer, W. W. Hitchcock, D. F. Cheaney, I. T. Fritz, and C. H. Lindberg. Second row: W. F. Hudiburg, H. T. Hancox, A. B. Geren, M. B. Henry, O. H. Ruhmann, W. W. Johnson, A. H. Hutchins, and H. G. Roessner. Third row: J. W. Baldwin, R. H. King, J. R. Nolan, C. C. Collins, W. H. Winters, O. W. Holloway, J. W. Johnston, and E. O. Brace.

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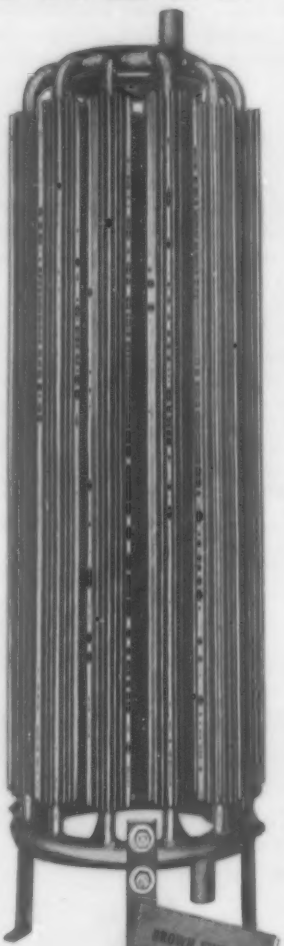

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Nitroparaffin Plant Set

STERLINGTON, La.—Commercial Solvents Corp. has started construction of a $5,000,000 nitroparaffin plant.

The new plant is expected to go on stream in August 1955. In addition, the company is enlarging existing facilities for nitroparaffin derivatives at Peoria, Ill.

Production will include the four basics, nitromethane, nitroethane, 1-nitropropane, and 2-nitropropane, plus several derivatives such as the aminohydroxy compounds and hydroxylamine salts. These chemicals find end uses in agriculture, textiles, rubber products, petroleum, paints, varnishes, lacquers, printing, plastics, and pharmaceuticals. The company is continuing market research on several hundred aliphatic nitrohydrocarbon derivatives which have been prepared and show promise.

Engine Research Stepped Up

PITTSBURGH.—Petroleum research organizations are stepping up investigations in engine combustion. The latest is Gulf Oil Corp., which recently announced a $2,400,000 project for a large automotive laboratory to be added at the company's research center at Harmerville, near here.

Two new buildings will house the most advanced installations in the world for fuel and lubricant testing in internal combustion engines, the company said. All phases of this field will be explored, from fundamental research on future trends to problems at the garage level.

A two-story building comprising 20 offices and a conference room for the Automotive Engineering Division will be joined by three single-story wings housing test cells, engine rooms, and maintenance facilities.

Expansion Near Completion

VANCOUVER, B. C. — Standard Oil Co. of British Columbia is nearing completion of a modernization and expansion program which will boost the Vancouver refinery at Burrard Inlet from 8,300 to 11,000 bbl. per day.

The project includes a 3,700-bbl. per day Model IV fluid catalytic cracking unit licensed by Standard Oil Development Co., an 800-bbl. per day catalytic polymerization unit, and facilities for producing 1,200 bbl. per day of asphalt.

The plant will process Alberta crude from the Trans Mountain pipeline. Fluor Corp. of Canada, Ltd., has the conttract for engineering and construction.

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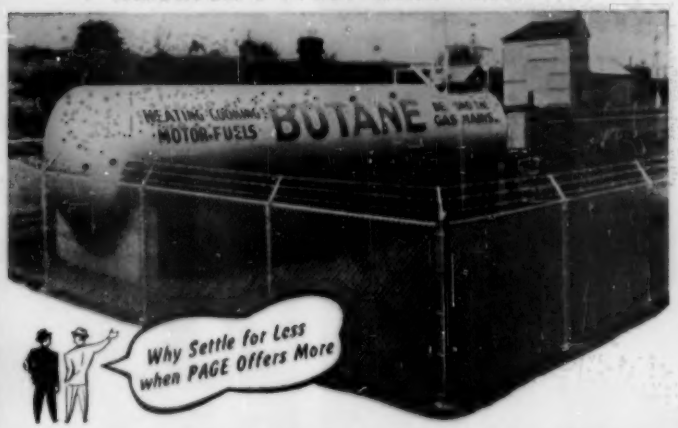

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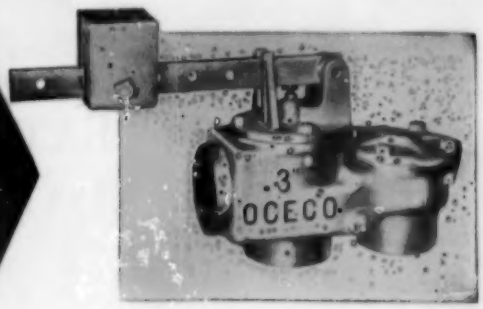

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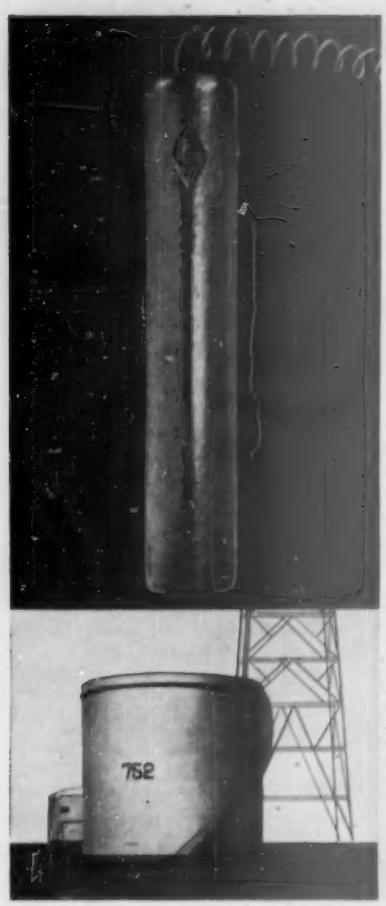

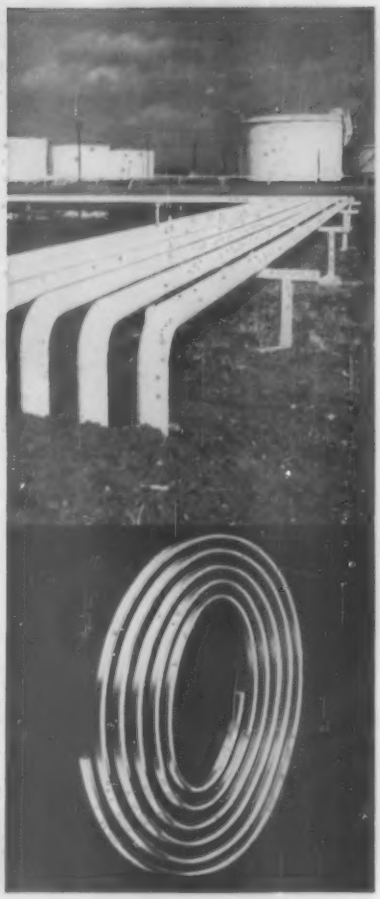

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How in-place plastic coating performs in field service

by J. C. Watts

WITH 6 years of successful usage behind it and a present status of continually improving methods and materials, in-place coating for sour crude, gas, and gasoline lines will generally show a payout time of from 1 to 5 years, depending on line length and corrosion severity.

Improved cleaning methods, resulting in better bonds, and the development of high-solids vinyl and epoxy-type coatings have been major steps in this field. However, one of the most serious problems, the drying of the coating, has not been completely solved, although improvements have been made.

Though plastic coatings have proved successful and show a definite payout, an economic study should be made to determine the most practical means of protection. Generally this will be plastic coating, but on new lines, or on lines longer than 5 miles, other methods may prove more economical.

Cleaning methods . . . The general acceptance of in-place coating has been hindered by the cleaning techniques more than any one factor. It has been a basic principle of plastic-coating application to have an exceptionally clean surface with a good anchor pattern for the paint film. Since this is impossible for in-place application, many believed that coating would not stay on the pipe.

However, inspection of coated lines consistently has shown the bond to be poorer than is considered necessary for other plastic-coating applications. These coatings have remained in good condition year after year and have continued to provide leak-free service. Apparently the surface preparation is not as critical in this use as in others.

Author is with the Humble Pipe Line Co., Midland, Tex. Condensation of a paper presented at the South Central region meeting of the National Association of Corrosion Engineers, October 12-15, 1954.

Three types of surface contaminants which must be removed before coating are: (a) grease, oil, dust, etc.; (b) scale; and (c) corrosion stimulators. In addition to abrasive action, three cleaning procedures are used in removing these contaminants and the elimination of any of the three is undesirable. The procedures are:

1. Solvent cleaning.
2. Alkaline cleaning.
3. Acid cleaning.

Solvent cleaning is the least effective of the three and where possible should be used only to supplement the other two.

Alkaline cleaners are more efficient, cheaper, and less hazardous than solvent cleaners. Since heat enhances the activity of the alkaline cleaner, it is not as effective when used cold, as is necessary in this operation, but it will prepare the surface for acid cleaning.

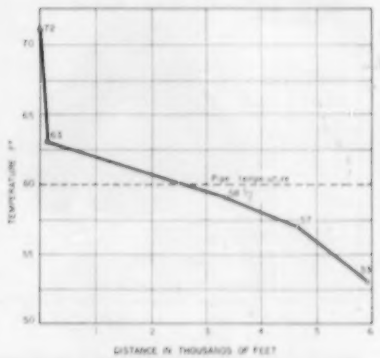
Acid solutions must be used after the alkaline cleaning since coating will not bond to an alkaline surface. In addition to acids, the solution contains oil solvents, wetting agents, and an inhibitor. It effectively removes light rust and scale, and the phosphoric acid which it contains reacts with the metal to form a film in insoluble iron phosphate. After cleaning with acid, the surface is easily neutralized by rinsing with water.

Drying . . . "Solvent washing" of the applied coating has been the factor limiting the length of line that can be coated in one operation. Drying air moving through the pipe picks up solvent vapors from the plastic film and, at the point where the air becomes saturated with solvent, the plastic film is washed off the pipe by the condensing vapors. Aparently this occurs when the air is moving too slowly or through too long a length of line. It also occurs where pipe is exposed and is colder than pipe underground.

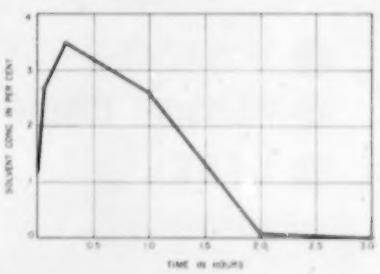
If air through the line is stopped before the coating is dry, the solvent concentration will build up in the stagnant air and condensation may occur. Although the coating appears to be dry, there is often enough solvent left to cause washing in a confined atmosphere.

There is evidence that better results are obtained by aspirating air at atmospheric temperature and reduced pressure through the line than when warm compressor air is blown through the line. The reduced pressure aids the solvent's escape from the wet film and reduces the possibility of pockets being trapped after the coating has filmed over.

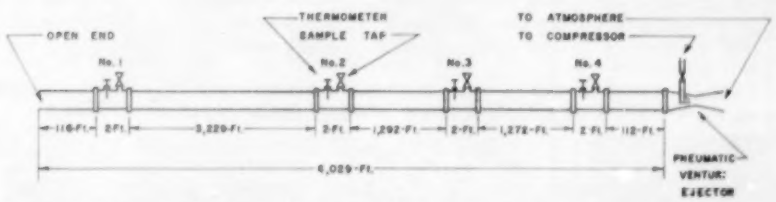
In establishing drying procedures to minimize danger of solvent washing, a series of tests were made on the drying rate under field conditions. Data was collected during coating of a 6,000-ft.,



VARIATION of temperature along line after 15 minutes of drying. Fig. 2.



CHANGE in solvent concentration with time at test point 3. Fig. 3.



TEST POINTS for making temperature and solvent-concentration measurements during drying operation on internally coated line. Fig. 1.

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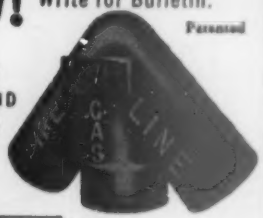

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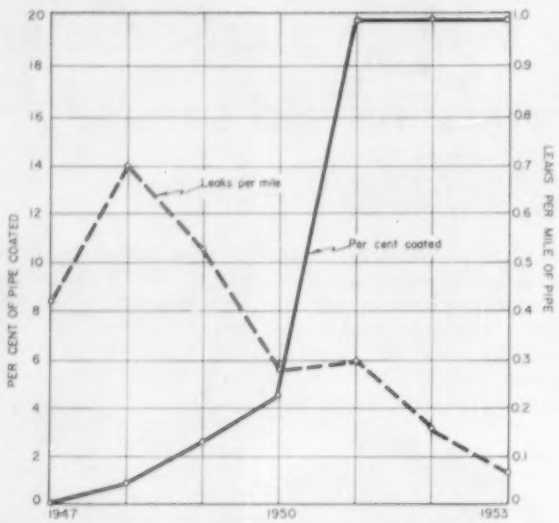


THE NUMBER of leaks in the Fuhrman-Mascho field has steadily declined as more lines have been internally coated. Fig. 4.

3-in. line using vinyl formulation containing 48 per cent solvent. Taps were placed in the line for thermometers and for sampling of the pipe atmosphere (Fig. 1).

Drying was done by aspirating air through the line at a velocity of 155 ft. per minute and a suction pressure of —1.2 in. of Hg. Temperature dropped suddenly in the first 100 ft. and continued to drop along the line as shown in Fig. 2. As drying progressed, the temperature approached the original pipe temperature.

Data collected at Test Point 3 and plotted in Fig. 3 shows change in solvent concentration with time. The concentration increased to a maximum of 3.5 per cent after 15 minutes and then gradually dropped to 0.2 per cent after 2 hours. Data for other locations was similar. Although the coating appeared dry and tests showed no solvent present, washing occurred overnight. No similar tests have been run while drying under pressure, nor is data available for lines of other sizes and lengths.

Coating materials . . . A major problem in development of in-place coating was finding a suitable coating material. Conventional vinyls used in the early stages had a tendency to run and sag and were susceptible to severe washing. Thermosetting resins were also tried but these proved too tricky for field use and had the added disadvantage of being brittle and having poor bonding qualities.

After approximately 3 years' development, a vinyl has been offered which is well suited to the application. It has a very high solids content and is fast drying, reducing the danger of washing.

The most recent coating which shows promise is an epoxy-base material which has excellent adhesion and is easily applied. It has not been under test in field installations long enough for complete evaluation, but laboratory tests show it to be inferior to vinyls in submerged oil service. This is probably due to its brittleness which causes cracks and checks as the pipe expands and contracts.

Also available for in-place coating is a system using a vinyl wash primer and an air-drying phenolic coating. With this system there is no danger from solvent washing but the water formed during the polymerization must be removed.

Coating application . . . In general, all of the contractors doing this type work use the same method of coating appli-

TABLE I—COMPARISON OF MAINTENANCE COST FOR YEAR PRIOR TO COATING AND COST OF COATING FOUR LINES IN FUHRMAN-MASCHO FIELD

Line—	No. of leaks	Bbl. of oil lost	Est. cash loss, oil and leak repairs	Length	Cost of internal plastic coating
Gulf-W. T. Ford Batt. No. 1	6	245	$1,090	2,968	$860
Skelly-W. T. Ford 4-in. discharge	21	737	3,500	7,380	2,140
Shell-E. F. King 4-in. gravity line	6	113	745	2,610	757
Mascho 6-in. discharge	22	925	4,065	45,400	20,430

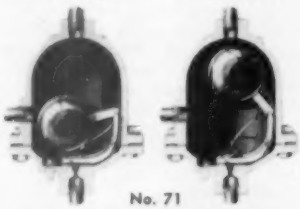
for Compressed Air and Gas Drainage

ARMSTRONG *Snap-Action* TRAPS

Assure Wide Open—Tight Shut Operation

No. 71-315 forged steel Armstrong "Snap-action" Traps draining water from natural gas scrubber.

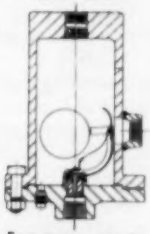
TRAP CLOSED TRAP OPEN



No. 71

Spring holds valve tight until float buoyancy overcomes spring pressure. Then spring snaps up, opening valve wide. Before all water leaves trap, valve snaps closed.

FORGED STEEL No. 71-315



For pressures to 1000 lbs. Same mechanism as No. 71.

Positive action, no dribbling, no hunting, no gas or air loss—these are the advantages of the Armstrong "Snap-action" ball float trap with spring-powered valve. The valve is always water-sealed. Fine dirt and grit won't interfere with operation.

Don't worry about maintenance. The flat strip spring of special Swedish steel lasts for years in ordinary service. Valve and seat are hardened chrome steel. All other internal parts are stainless steel. Special materials are available for special corrosion problems.

Like all Armstrong products, these traps are *unconditionally guaranteed* to satisfy. Call your local Armstrong Representative, or write Armstrong Machine Works, 868 Maple St., Three Rivers, Mich.

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Free Bulletin 289 gives complete selection data on ball float traps for draining water *and light liquids*. Ask for your copy. No obligation.

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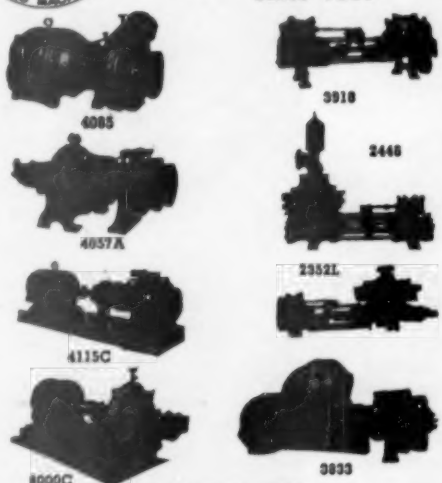

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PIPELINE PATROL

cation, differing mainly in the type and number of plugs and in the cleaning method. Forcing the cleaning or painting plugs through the line by compressed air is a method used by all contractors. Plugs are put in and removed from the line through special loading joints which have valves for injection of cleaning and coating material.

Prime and paint coats are applied by placing the material in front of a rubber plug which is pushed through the line at high speed, or by placing material between counterfacing plugs and pushing it through against a constant back pressure. Both methods seem to give equally good results.

Performance . . . Humble Pipe Line Co. has approximately 225,000 ft. of pipe in its West Texas gathering system which has been internally plastic coated in place. This is 3.8 per cent of the total pipe in the system. Lines which were coated had experienced 253 leaks from 1945 to the time of coating. After coating, with the exception of two lines in which a satisfactory coating was not applied, there have been no leaks due to internal corrosion. Lines in the Fuhrman-Mascho field, Fig. 4, indicate the effectiveness of plastic coatings, since the majority of internal protection in that area is provided by plastic coatings.

Economics . . . Coatings in lines handling sour crudes will normally pay out in about a year through savings in leak repairs and oil loss. When loss in investment and cost of major repairs are considered, the payout time will be less. The estimated maintenance cost on four lines for a year prior to coating is given in Table 1.

The short lines show a pay-out time of about 1 year but longer lines, like the 9-mile, 6-in. line of Table 1, will not pay out as fast. Even though the corrosion might be more severe, the number of leaks per foot will not be as high and coating cost per foot will be practically the same.

Other advantages . . . In addition to providing corrosion protection, there is evidence that plastic coating will raise line throughput by lowering the roughness factor. No records are available on tests made on oil or gas lines, but results of tests on water lines show considerable increase in throughput are possible with internal coating.

Plastic coatings are also being used successfully for paraffin control in oil-well tubing and flow lines.

No. 176-1B Lubricating Cap

Working together, the Ratigan Lubricating Cap and the Ratigan Stuffing Box make an efficient combination providing the polished rod with continuous lubrication . . . the lubricating cap when the flow of oil in the tubing is retarded, and the self-oiling stuffing box when the well is not heading. The lubricating cap provides longer wear of the packing rubbers and more economical operation of the stuffing box.

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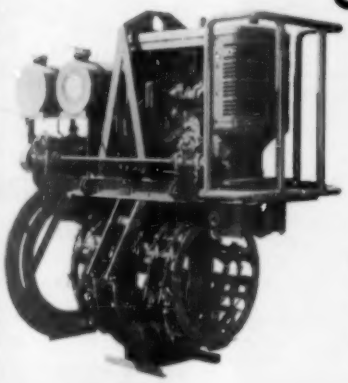

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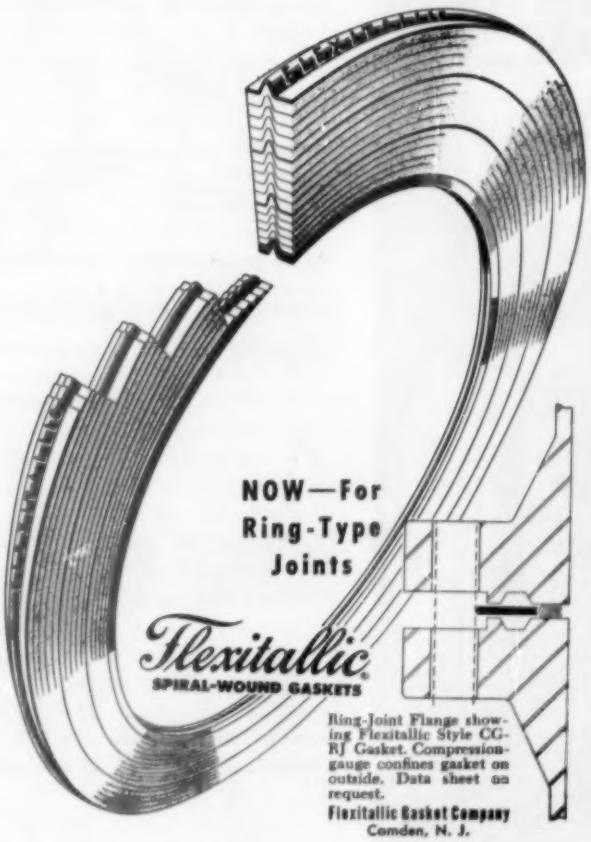

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Ring-Joint Flange showing Flexitallic Style CG-RJ Gasket. Compression-gauge confines gasket on outside. Data sheet on request.

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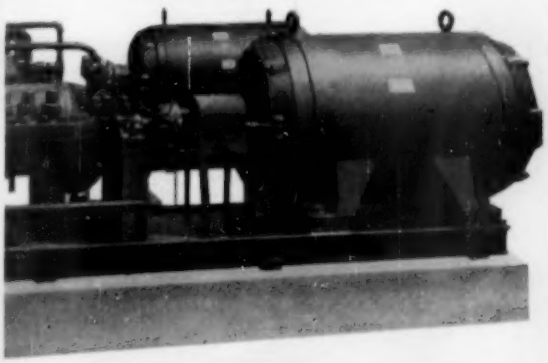

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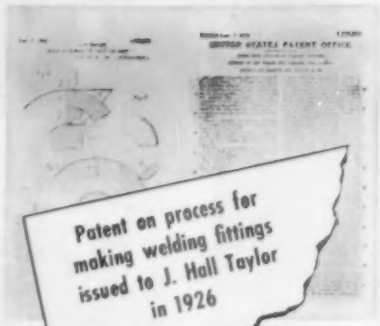

Patent on process for making welding fittings issued to J. Hall Taylor in 1926

The formula was written in 1926—

The invention of oxyacetylene and electric arc welding touched off the greatest single advance in modern piping practice—pipe welding.

The old way—the screwed fittings and heavy flanged fittings—put up a brave fight, but the handwriting was on the wall! For all important piping the old method was through.

Proof that Taylor Forge had foreseen this clear back in 1926 is shown above. Significantly enough, the process covered by this patent is still employed to give WeldELLS certain advantages not found in any other welding fittings.

But Taylor Forge experience had suggested careful procedure — had foreseen that pipe welding could not advance beyond its crude, torch-happy stage until *all* necessary fittings were provided to make *complete* welded systems.

It took a number of years to do this job with Taylor Forge thoroughness, but in 1931 the announcement was made of the first complete line of seamless butt welding fittings — the first line to include not only elbows and return bends, but also full branch and reducing tees, concentric and eccentric reducers, stub ends, caps, and the all-important (and then revolutionary) welding neck flanges.

Out of 31 years of designed piping experience had come the greatest contribution to piping permanence.

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. . . What's New in Equipment?

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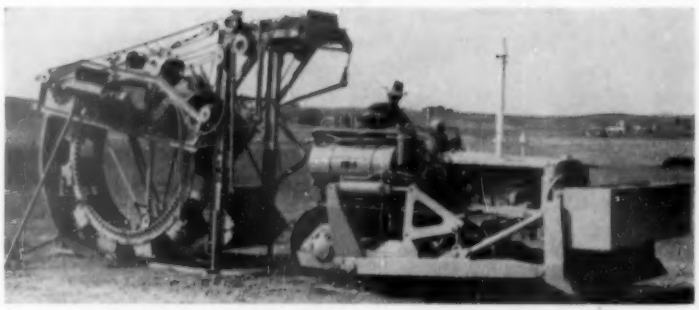
by Dan B. Miller



Ditcher Can Be Removed in 30 Minutes

The Model CW-4 detachable ditcher is an attachment for a Caterpillar diesel D-4 tractor and can be detached within 30 minutes or less. The superior maneuverability of a tractor now becomes available for difficult ditching operations. When unattached the tractor is fully capable of performing many other tasks. There are numerous jobs on which this Unimatic-Caterpillar combination may be used; for example, oil-field gathering lines, oil and gas transmission lines, and lease lines.

The Model CW-4 ditcher will dig to a maximum depth of 5 ft. 6 in. with the width of cut ranging from 15 to 24 in. in increments of 1 in. This is an all-hydraulic unit with all controls within the normal reach of the seated operator. The Unimatic drive permits the detachable ditcher to move forward at any speed from zero to 26 ft. per minute. Unimatic's completely new conveyor starts, stops, and reverses instantaneously, and is operated completely independent of the digging wheel. Improved pulley design eliminates lateral belt travel and the new rubber guides and single pins contribute greatly to the efficiency and life of the conveyor belt. The length of the CW-4 ditcher with a straight bulldozer is 22 ft. 8 in. The width is 8 ft. 3 in., and the over-all height is 9 ft. 11 in. The weight of the ditcher ranges from 6,660 to 6,930 lb. *Unimatic Corp.*

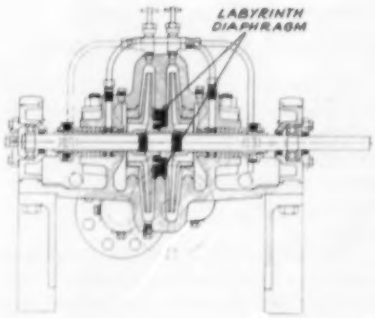
Check No. 1 On The Time-Saver Card

●

Two-Stage Pump Features Parts Interchangeability

A new series of two-stage pumps for handling clear liquids, designated as Fig. 3305 line, are available in five sizes, providing heads up to 1,000 ft., and capacities up to 1,000 g.p.m. Opposed impellers insure hydraulic balance, and thrust balance is achieved by the use of a new labyrinth diaphragm.

The pump was designed with special attention to operating efficiency and ease of maintenance. The casing is horizontally split, and the interior can be inspected, and the rotating parts



removed and replaced, without disturbing piping connections.

Bearing spans have been kept short, resulting in major space saving. Wide interchangeability of parts has been provided, so that spare-parts inventories can be kept at a minimum. For example, only two shaft and rotating-parts assemblies are necessary to cover all five pump sizes. Furthermore, many of the parts of Fig. 3305 pumps also are interchangeable with the Goulds Fig. 3405 single-stage pumps.

The direction of rotation of the new pumps can be changed in the field, without any additional parts. This is made possible by a patented locking shaft sleeve. The new pump can be supplied with either conventional stuffing boxes, or with mechanical seals, as desired. *Goulds Pumps, Inc.*

Check No. 2 On The Time-Saver Card

●

Smithco Was Designed As Multipurpose Trailer

A new trailer, called the Smithco, was designed to fill a need for a low-cost multipurpose unit that could be used as an office and/or a parts room or other combinations by construction and engineering firms or contractors.

The sturdy 21-ft. trailer is custom-built and therefore can be adapted to the specific needs of the owner. The versatility of this trailer makes it ideally suited for a field office, parts room, portable machine shop, dressing rooms and toilets, field laboratory, movable display rooms, or just a place to lock up tools at night. *L. B. Smith, Inc.*

Check No. 3 On The Time-Saver Card

What's New... Use the handy Time-Saver Cards

Condensifilter Dehydrates, Filters Compressed Air

Models M-30 and M-100 of the Condensifilter for dehydrating and filtering compressed air are rated at 30 and 100 cu. ft. per minute, respectively, at line pressure of 100 psig. Both models feature a condenser to reduce compressed-air dew points plus a disposable filter cartridge for removing solid particles. The new prefabricated steel case has a spun elliptical head that permits operating pressures up to 200 psig. All sealing is with O-rings, eliminating the need for tools to dismantle the units for service.

In operation, compressed air enters the Condensifilter through the steel center shaft and passes into the spiral, copper condensing section. The condenser reduces the temperature of the air to within 2° or 3° of the cooling water temperature. The air then passes upward and through the cotton-felt filter cartridge, reenters the center shaft, and returns to the system. Condensed vapors drop into the condensate collection chamber, and can be manually discharged or trapped to drain. *Hankison Corp.*

Check No. 4 On The Time-Saver Card

●

Electric Heater Made With Copper-Sheathed Cable

Nelex new electric heater which makes use of copper-sheathed, mineral-insulated, resistance cable, is sold in either standard or special length, depending upon the customer's requirements. Standard lengths are available from stock.

Designed to operate at temperatures up to 500° F. in open air, working temperatures of 1,000° F. can be tolerated when the heater is immersed in liquids to exclude oxygen. Hermetically sealed at the factory, the heater can be immersed in any liquid not harmful to copper or it may be imbedded in concrete or earth.

The rugged, flexible construction of the heater provides physical strength to withstand the abuse, corrosion, vibration, and shock of industrial use. Because of its annealed-copper sheath it can easily be formed to fit irregular shapes and surfaces, thus providing heat exactly where it is needed. The low original cost and ease of installation makes the new Nelex heaters a desirable and economical source of heat.

Some of the typical uses of Nelex heating units are for surface heating of metals; pipeline heating, either external or internal; liquid heating; compound melting and heating; and deicing and freeze prevention. *Nelson Electric Manufacturing Co.*

Check No. 5 On The Time-Saver Card

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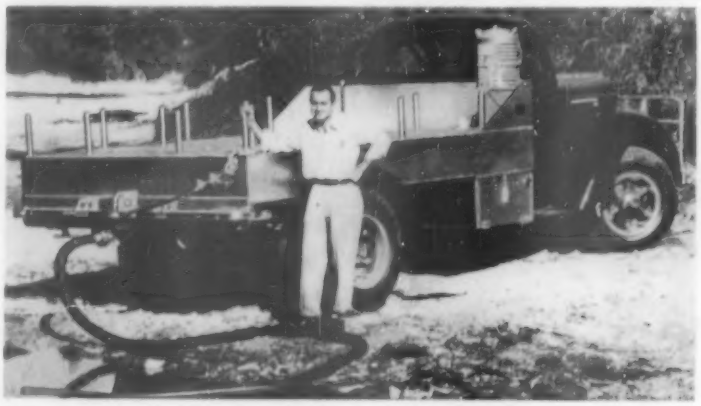


Low-Bed Water Truck Also Carries Cargo

A new low-bed water truck is capable of carrying extra-large bulk loads. Known as Model FT-50 flat-top water truck, the truck employs a large-capacity, flat water tank, the top of which serves as the bed of the truck. The tank is constructed of heavy-gage steel with the floor section covered with safety plate. Sixteen removable metal stakes are located along the edges of the top side of the tank to prevent loss of cargo.

One of the truck's outstanding features is its vacuum-lift system of tank filling. This utilizes suction from the manifold to draw water into the tank. Twin check valves prevent water from being sucked into the manifold. The tank interior is divided by baffles into 12 interconnecting compartments which prevent rapid shifting of fluid weight.

Standard equipment includes water tank, 2-in. suction hose, 16 removable bed stakes, tool box on each side, winch, vacuum lift, and 3-gal. drinking-water can. Tanks are available in 650, 800, and 1,000-gal. capacities. *Davey Compressor Co.*

Check No. 6 On The Time-Saver Card

●

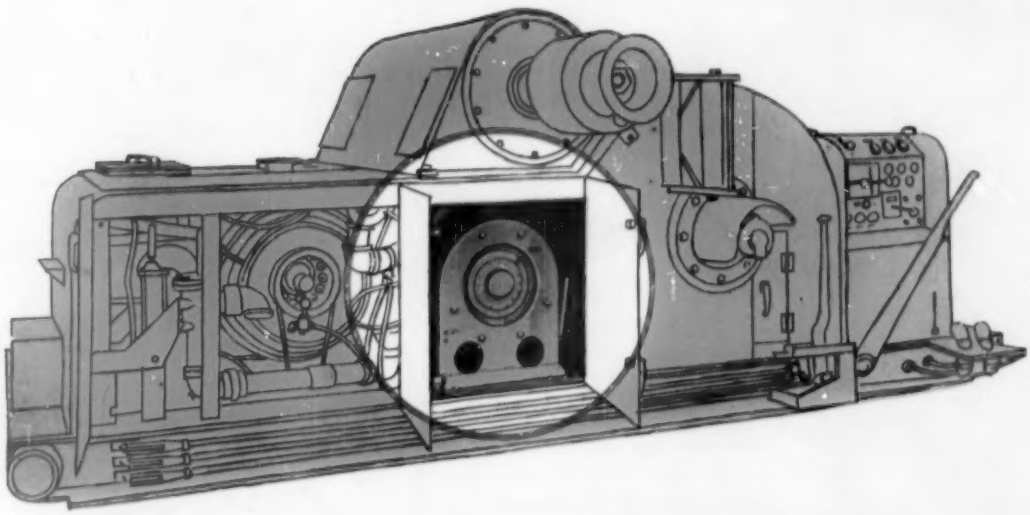
Integrator Gives Greater Capacity, Easy Changeover

A new model integrator, a device that mechanically computes the metered volume of gases, steam, or liquids from orifice-meter charts, offers greater capacity, simplified changeover, speedier operation, and increased resistance to wear.

The electrically operated integrator features a countersetback assembly operating from the main calibration post that enables the operator to run practically all ranges of charts at any base pressure. As a result, range settings are almost infinite in number.

The same setback principle has been applied throughout the machine, elim-

UNIT RIG'S
HYDROMATIC BRAKE
is an integral part of the draw works . . . .
AS IT SHOULD BE!



UNIT RIG'S Hydromatic Brake is built into the draw works . . . it is NOT a separate package. This integral unit, with built-in piping, is readily accessible.

The brake is driven from the jackshaft through a clutch. It is equipped with UNIT RIG'S exclusive variable flow control and dump valve assembly to provide fast pipe fall with maximum braking power as desired. This feature keeps trip time to a minimum.

The UNIT RIG built-in Hydromatic Brake is just one more reason why your next draw works should be a UNIT RIG.

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UNIT RIG & EQUIPMENT CO.
TULSA, OKLAHOMA, U. S. A.

UNIT RIG DRAW WORKS ARE SOLD THROUGH THESE DISTRIBUTORS
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HERE'S THE *New* RUPTURE DISC FOR BS&B SAFETY HEADS...

...ESPECIALLY DESIGNED FOR USE IN LOW PRESSURE APPLICATIONS UNDER SEVERE CORROSIVE CONDITIONS!

For many years the problem of producing a low pressure rupture disc that could withstand prolonged exposure to severe corrosive conditions was a perplexing one. Yet, it was a problem that *had* to be solved, particularly for the Process Industries.

Therefore, it was only natural that BS&B — originator of the Safety Head — should come up with the right answer in the form of a flat type rupture disc whose bursting pressure is controlled by a top metal section, isolated from the corrosive contents of the protected vessel by a sealing membrane of Teflon or Kel-F.

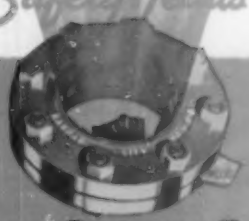
If back pressure is not anticipated, the bottom metal section of the disc is cut open to full relieving capacity (Model 1A). However, if a vacuum support is needed, the bottom metal section is constructed similar to the top section to serve as a vacuum support (Model 1B). Top and bottom sections are spot welded together to give a single compact unit.

Disc Models 1A and 1B are constructed of corrosion-resistant metals such as Inconel, stainless steel, nickel, Hastelloy B and Monel. Either model is available in 2", 3", 4", 6", 8" and 10" sizes. Pressure ratings are from 8 to 100 lbs. Close design tolerances are an inherent feature of this type disc.

If you have a pressure relief problem which you have not been able to solve satisfactorily with the regular pre-bulged type of disc or other types of relief devices, try the new BS&B Model 1A or 1B disc. It fits any standard size BS&B Safety Head flanges you may now have in service. Also available in a complete assembly consisting of inlet and outlet flanges, rupture disc, studs and nuts.

Your BS&B Man will be glad to give you details . . or you may write for descriptive literature and prices.

BS&B Safety Heads



THE "CIRCUIT-BREAKER" OF Pressured Systems

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY

BLACK, SIVALLS & BRYSON, INC.
Safety Head Division, Dept. 2-A10
7500 East 12th Street, Kansas City 26, Mo.

inating the various separate pen centers and pressure-range hole segments. When the machine is in calibration for one make of orifice-meter charts, it is in calibration for all makes of charts that the machine will calculate. This feature simplifies operation and saves operating time by allowing the operator to change from chart to chart at will.

For greater resistance to wear, points of motion or pivot points have been set in ball bearings, thereby eliminating wearing points.

Other advances claimed for the instrument include improved brake assembly; static and differential carriage assemblies redesigned for greater operating efficiency; new cam shifting design; centers individually calibrated on fitted drums, each independent of the others, connected only by the steel tapes which transmit motion. *Rockwell Manufacturing Co.*

Check No. 7 On The Time-Saver Card

Pressure Cells Designed For Pipeline Service

SR-4 pressure cells are specially designed for rough handling by pipe fitters and to meet the requirements of oil-pipeline service. Pressure-measuring, controlling, and telemetering installations are in service in several major pipelines in this country.

This cell (Type B-1) is similar to the standard Baldwin cell but includes special features such as a heavy-steel case and welded assembly, making the cell rugged enough for pipe-wrench tightening. Stronger signals for the remote pressure-measuring, controlling, and telemetering equipment used in controlling pipeline operations are provided by increasing electrical output. This is done by use of resistance-wire strain gages of 175-ohm resistance. The pressure sensitive cell in contact with the fluid is of Type 410 stainless steel. Eight sizes from 100 to 2,000 psi. are

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The marketing of petroleum products is complex. It requires a well coordinated team experienced in both domestic and industrial markets. At Beacon Petroleum Company you will find such a team. Specialists in every phase of petroleum marketing and transportation devoted to one thing . . . moving *your* products successfully to their proper markets.

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MARKETERS OF NATURAL GASOLINE, BUTANE-PROPANE, MOTOR FUEL, FUEL OILS

SPEED plus

94′ TRAILER-MOUNTED MAST FOR DRILLING AND SERVICING...

The new Lee C. Moore trailer-mounted mast can be ready to drill in record time from arrival at location.

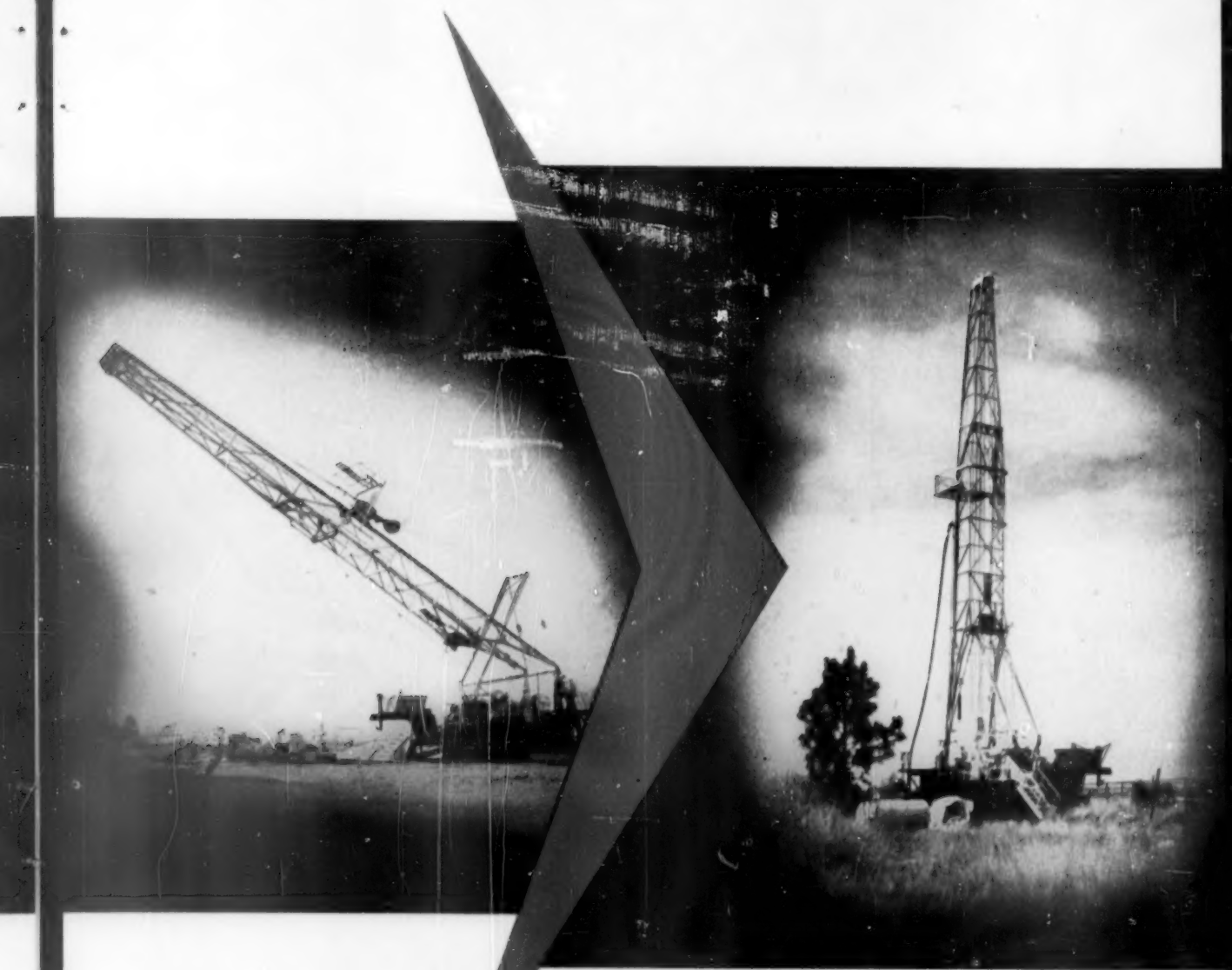
It telescopes to transportation length in a matter of minutes and when extended the legs are in true alignment. There is no overlap of upper and lower sections.

No guy lines are required.

The draw works and mast never leave the trailer. The truck backs trailer up the ramp to the substructure. The trailer is then secured in place and the mast is ready to raise.

Write for complete information.

EXTRA RUGGED DESIGN



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Export Office — Room 624, International Bldg., 630 5th Ave., New York 20, N. Y.

Stroke of Genius

◆ No question but what these men are playing it smart.

They're running a Precision Pump—mostly because they know they can get a long, even stroke without any flexing or binding. That's possible because Precision Pumps are built to exacting standards, with special attention to items like the fit and alignment of critical working parts.

The barrel tubes are tough, non-galling seamless steel, machine-straightened and finished to a perfect inside working surface. The plunger consists of several 12" sections, perfectly aligned on a seamless steel mandrel tube. Chrome-plated or hardened-steel plungers and barrel tubes, heavy-duty pumps with double-thick wall barrel tubes, and stroke-through pumps can be furnished for various well conditions.

The next time you run a pump, do like these men did. You'll be glad you did, because you'll be pleased with the long, trouble-free service you'll get.

"Best Pumps in the Oil Patch"

Your store or one of our factory representatives will be glad to give you more information without obligation ●

H-F Precision ROD PUMP

Harbison-Fischer Mfg. Co. ▪ Fort Worth

available for use wherever service conditions are similar to those encountered in oil-pipeline installations. *Baldwin-Lima-Hamilton Corp.*

Check No. 8 On The Time-Saver Card

●

Cowley Compactic is a New Automatic-Leveling Device

A new automatic-leveling tool is designed as the Cowley Compactic automatic level. Its optical principle employs no crosshairs, bubbles, or leveling screws. No focusing is necessary.

The camera-sized unit need only be placed on its sturdy tripod or wall-top stand to indicate automatically whether the target is level. The instrument is permanently adjusted, ready to use, and practically free from wear. *Engis Equipment Co.*

Check No. 9 On The Time-Saver Card

●

Redesigned Lug-All Winch-Hoist Will Lift 1½ Tons

The Lug-All winch-hoist has now been equipped with a new and more rugged main frame that permits the advantageous use of this unit for many more applications. The ratchet teeth are now protected from rough surface by the new frame, which is a distinct advantage when working under unfavorable conditions.

The new Lug-All weighs 9 lb., yet it can handle up to 1½ tons. It is equipped

HYDROTAN and HYDROCARB

OVER 3 YEARS

of successful mud control experience with Baroid's

ALKALINE-ORGANIC THINNERS

A chemical mud thinner is a material that reduces drilling fluid viscosity and gel strength by chemically controlling the dispersion and degree of hydration of the colloidal particles suspended in the fluid.

The organic thinners are usually compounded with alkaline chemicals to increase their efficiency, speed their solubility and, through the amount of alkalies added, give pH control of the mud.

Baroid's HYDROTAN and HYDROCARB are the original successful pre-mixed alkaline-organic mud thinners. HYDROTAN, an alkaline-tannate, and HYDROCARB, an alkaline-Carbonox, are compounded as liquids, then dried and packaged in handy 50-pound bags.

The ratios of alkali to organic in these compounds, determined by years of field experience, allows the most effective mud control over the widest range of drilling conditions.

The successful widespread field use, since 1950, of Baroid's HYDROTAN and HYDROCARB has contributed to more efficient and economical drilling fluid control.

HYDROTAN and HYDROCARB are available from your mud product supplier.

NOW AS EVER...

you can rely on

Baroid

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Please send me full information about Baroid's alkaline-organic thinners.

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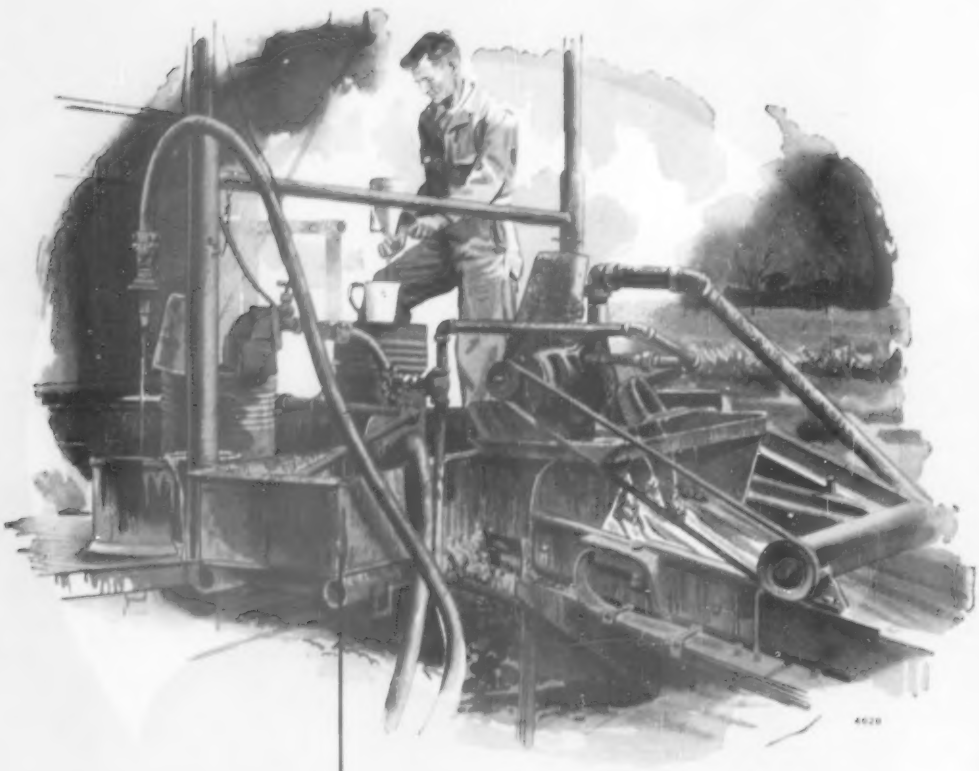


Anticipated mud problems

..are more easily controlled

Baroid products available at over 600 distribution points, throughout every active drilling area.

The most effective mud programs consider the formations to be drilled from spudding to completion, the equipment to be used, the amount of money to be spent, and the results that are to be achieved.

More than a quarter-century of Baroid research and experience provides your Baroid field man with the necessary information to help you plan your mud program . . . *before the well is spudded in* . . . and to solve mud problems while drilling. Baroid's complete line of field proved mud products, developed during years of drilling progress, are always available, everywhere, and are being continually improved to solve new problems.

Baroid field service engineers are available to assist you in your mud program planning. Use their services regularly for mud control that provides faster, safer, more economical drilling.

Baroid engineers have compiled a series of trouble shooting charts to help you solve your drilling mud problems. The charts can not prescribe a trouble-free mud for all conditions. They DO provide suggestions on specific mud problems encountered during the various phases of drilling your well. Write for your copy now.

..NOW AS EVER you can rely on **Baroid**

Baroid Sales Division • National Lead Company • Main Office: P. O. Box 1675, Houston 1, Texas

with a reversible safety handle that will bend when extreme overloads are applied. Loads can be backed off easily and safely due to an interlocking pawl arrangement. It has stainless-steel springs, oiled-for-life bearings and a 133-strand, flexible, preformed, aircraft cable, that winds on the drum and out of the operator's way. *The Lug-All Co.*

Check No. 10 On The Time-Saver Card

●

DAW Pressure Controls Are Weather Resistant

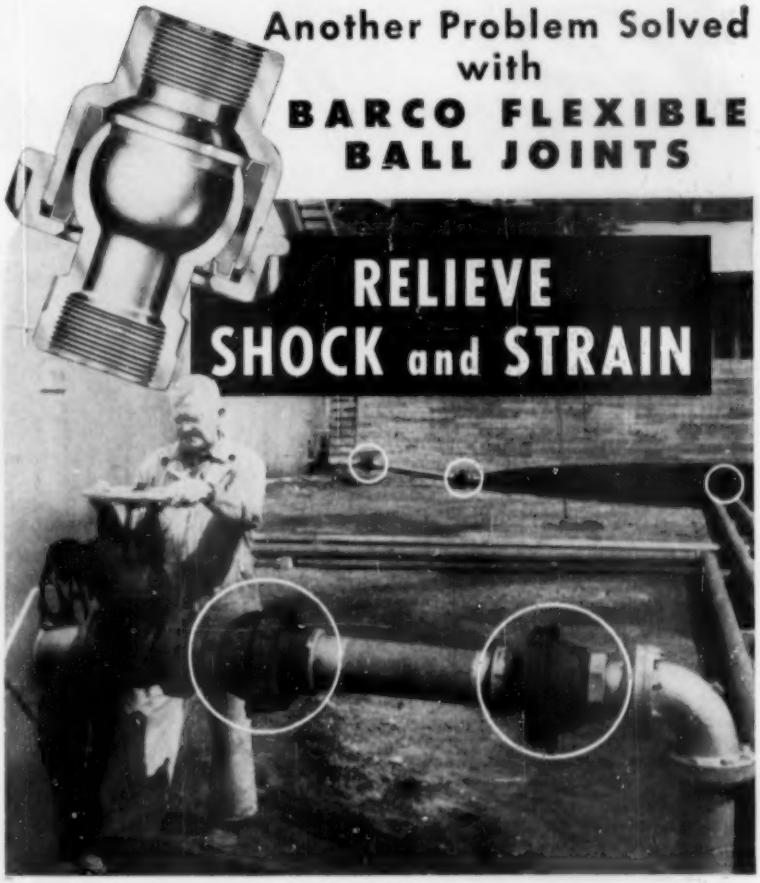
Mercoid Series DAW weather-resistant pressure controls are designed for outdoor use and are so constructed as to exclude a beating rain. They have many applications in chemical and petroleum plants. They conform to N.E.M.A. specifications.

Case is flanged and has a ¼-in. I.P.S. connection. The case and complementary parts are heavily zinc-plated and provided with a special coating that will withstand a 50-hour salt-spray test. The cover is neoprene gasketed to the case and is vented to provide draining of condensation. Vent is shielded against water when subjected to beating rains.

The gasketed glass port provides visual inspection of electrical-contact operation and permits checking operating points on the visible-calibrated dial. The external adjustments are also provided with a gasketed cover held in place by a simple wing nut. Series DAW weather-resistant pressure controls are available in 17 operating ranges from 30-in. vacuum to 300-2,500 psi. with sensitivities from 2 oz. to 20 psi., dependent upon range selected.

Circuit arrangements are available to open or close an electrical circuit on an increase or decrease of pressure. Multiple-circuit arrangements can be furnished to meet various needs. *The Mercoid Corp.*

Check No. 11 On The Time-Saver Card



1. **VERSATILE.** Barco Ball Joints solve many piping problems where flexible connections are needed to allow for movement, overcome misalignment, and guard piping against vibration, strain or shock.
2. **MAXIMUM FLEXIBILITY.** Up to 40° side flexibility with 360° rotating movement.
3. **MANY STYLES AVAILABLE.** Angle or straight; threaded or flanged connections. For pressures to 7,500 psi; temperatures to 1000° F. 15 different sizes, ¼" to 12".
4. **CHOICE OF MATERIALS.** Built to meet service requirements for steam, oil, gasoline, water, chemicals, and other fluids.
5. **ENGINEERING RECOMMENDATIONS.** Barco will be glad to send you complete information—ASK FOR BULLETIN No. 215.

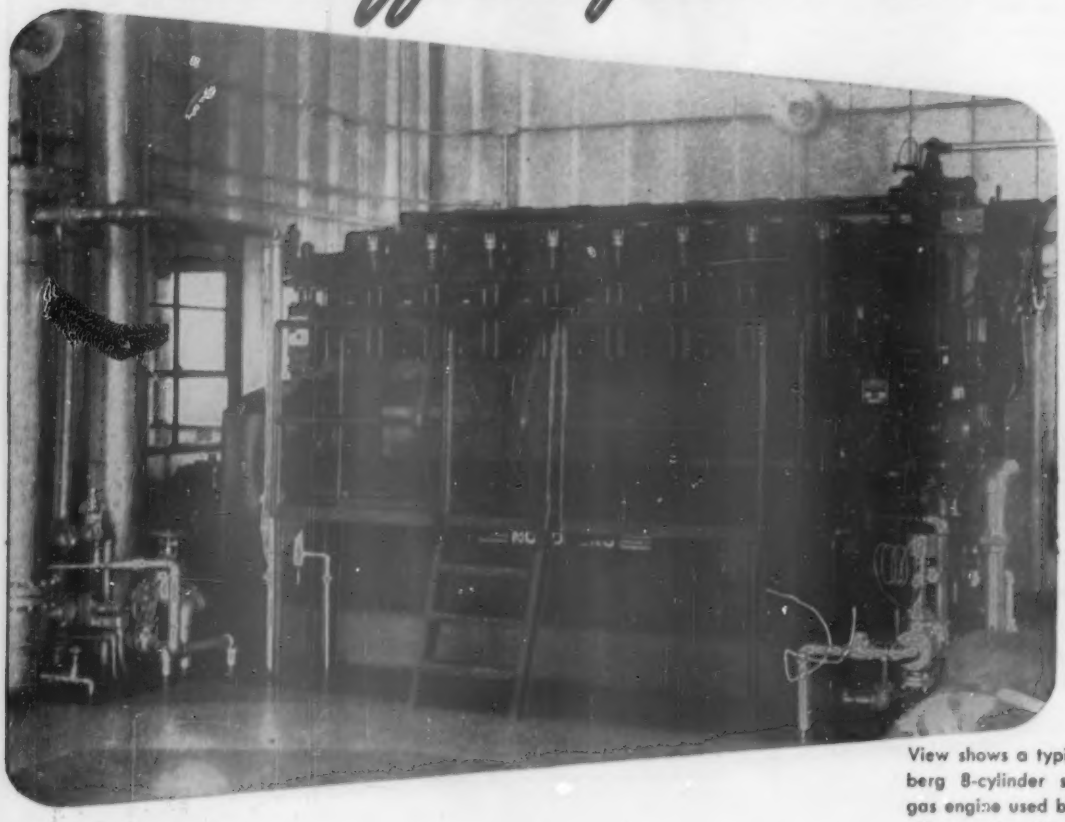
THE Tidewater Associated Oil Company, in their tank farm at Tacoma, Washington, had to allow for tank settling and expansion and contraction of piping and also for protection of piping and valves in case of earthquake shocks. They solved this dangerous and costly problem by installing Barco Flexible Ball Joints, Style 7-8, as shown above.

This is one of the many, many applications of Barco Joints in practically every field of industry and transportation. By allowing movement through every angle, Barco Ball Joints absorb strain and stress, permit expansion and contraction, and act as insulation to prevent corrosion from electrolysis. Barco Joints also facilitate quick break-down and setting up of drill rig equipment. Furnished in high pressure as well as standard styles, with threaded, flanged, or welding ends; steel, malleable, or stainless. Fire-proof and capable of handling high temperatures. Write for full information and drawings of piping installations. Barco Manufacturing Co., 539LL Hough Street, Barrington, Illinois.

BARCO

THE ONLY TRULY COMPLETE LINE OF FLEXIBLE BALL, SWIVEL, SWING AND REVOLVING JOINTS

Put more efficient power to work...



View shows a typical Nordberg 8-cylinder spark-fired gas engine used by a major oil company for pumping crude oil.

...*with* NORDBERG *SUPAIRTHERMAL* Spark-Fired Gas Engines

HIGH thermal efficiency of power-packed Nordberg four-cycle *SUPAIRTHERMAL* Spark-fired gas engines, in excess of 40% at full load, turns low fuel consumption into profit dollars. Designed and built to give years of dependable, economical service, Nordberg Spark-fired Gas Engines are available in sizes up to 4260 horsepower.

For further information write for Bulletin 221.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

0253

They're NEW

- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ ✓ the Time-Saver Cards.

Test Your Power, a new 20-page booklet, describes a simple direct method by which the purchaser of an industrial cooling tower can assure himself that the performance he purchased is the performance his tower delivers. The method outlined is simple, direct, and conclusive and requires a minimum of apparatus and effort. Every step has been checked and rechecked in hundreds of actual applications and the results are said to be conclusive when applied to large industrial towers of all types. *The Marley Co.*

Check No. 12 On The Time-Saver Card

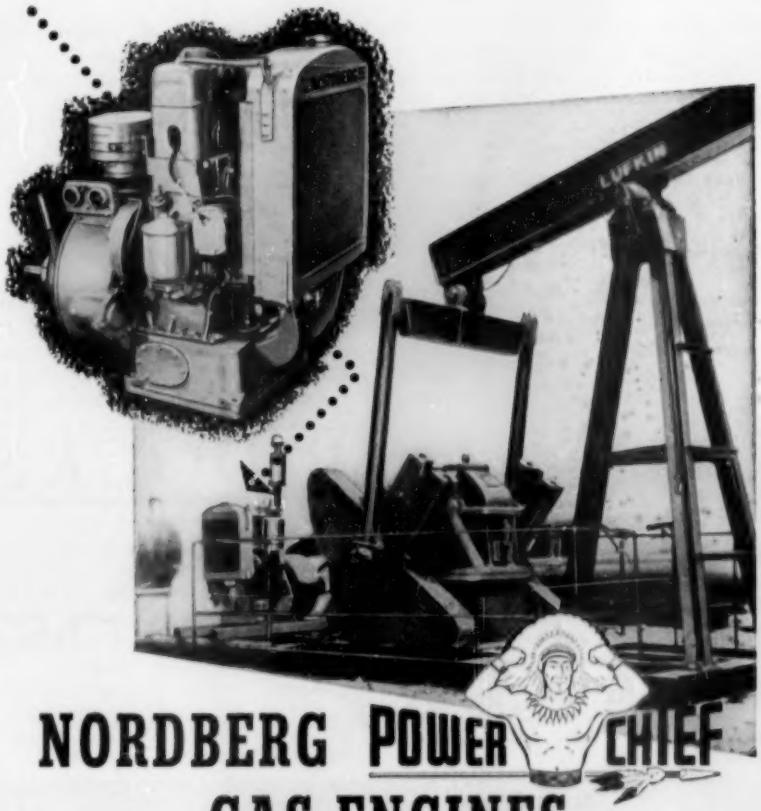
●

An Over-All Comparison Between Two Pressure-Vessel Codes, by Walter Samans, is the feature article of the fall issue of Alco Products Review. The Review first carried detailed comparisons and interpretations between the A.S.M.E. Code for Unfired Pressure Vessels and the A.P.I.-A.S.M.E. Code for Unfired Pressure Vessels for Petroleum Liquids and Gases in the spring 1953 issue. In the present six-page supplement, Samans has brought this material up to date with all pertinent changes made since that time to the text of both codes. Of equal interest is an eight-page feature on enlargement of Continental Oil Co.'s Lake Charles, La., refinery, describing the new facilities installed in the 45,000-bbl. per day plant. These include an atmospheric crude-topping unit and two catalytic crackers which were completed in 1953 and are now in full production. *American Locomotive Co.*

Check No. 13 On The Time-Saver Card

●

Engineering Guidebook to Microwave Radio Relay Equipment. The 51-page booklet contains photographs, cutaway drawings, floor plans, and technical data to acquaint communications engineers who are planning fixed or mobile microwave stations, or extensions of existing systems, with the design features and installation flexibility of R.C.A. microwave equipment. Information covered ranges from basic R.C.A. building-block microwave and



NORDBERG POWER CHIEF GAS ENGINES

keep production on schedule . . .

Here's the low cost answer to compact, dependable power for 'round-the-clock production pumping—the new Nordberg *POWER CHIEF* Gas Engine. Backed by many years of service to the petroleum industry, this Nordberg engine is ruggedly built to keep production on schedule day-in and day-out, even under the most severe operating conditions.

Available as straight power units, rated 18 hp max., with stub shaft or clutch power take-off . . . and as "packaged" generator sets producing up to 10 kw, Nordberg *POWER CHIEF* Gas Engines are simple to install and easy to maintain —always ready and able to serve you 24 hours a day. Clip the coupon for full details.

Nordberg Mfg. Co., Milwaukee, Wisconsin.

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Builders of America's Largest Line of Heavy Duty Diesels

MAIL COUPON FOR DATA

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Please send full details on the new Nordberg *POWER CHIEF* Gas Engines.

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Company_____

Address_____

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4-454-0

multiplexing equipment, which can be assembled in numerous combinations to meet every operational need, to typical system layouts, buildings, and antennas. *R.C.A. Engineering Products Division, Radio Corp. of America.*

Check No. 14 On The Time-Saver Card

●

Water in Process Use. The value of a broad approach to industrial-water problems through an over-all survey of process water is outlined in a new six-page folder. The folder gives examples of how a process-water survey can have some or all of the following benefits: conservation of critical materials, reduction of water use, and savings in waste-water treatment. Special knowledge and experience applied to one water problem will often lead to fringe benefits, unplanned for, but nonetheless welcome. *Hall Laboratories, Inc.*

Check No. 15 On The Time-Saver Card

●

DuMore Ball and Seat, an eight-page booklet describes the new DuMore ball and seat for subsurface pumps. DuMore is an alloy that approaches the hardness of tungsten carbide. The new valve is corrosionproof, nonmagnetic, and unaffected by high temperatures. The booklet contains information as to metallurgy, available sizes, and other data. *Harbison-Fischer Mfg. Co.*

Check No. 16 On The Time-Saver Card

●

Varec Tank Gaging Equipment. Bulletin CP-3007, a 72-page catalog covers all types of gaging equipment, from top-reading hand gages, to the latest pulse-code telemetering system. The complete line is described with illustrations, data tables, engineer's drawings, and installation diagrams. *The Vapor Recovery Systems Co.*

Check No. 17 On The Time-Saver Card

●

Petroleum Equipment and Supplies. Condensed catalog No. 54 carries an extensive line of equipment employed in the drilling and well-maintenance divisions of the industry. Drilling, servicing, and workover depth ratings, for average economical drilling conditions, for each of a line of 12 Hydrator drilling rigs are shown in color on an artist's rendition of the earth's strata. A typical power layout is shown for each model. Auxiliary equipment, such as swivels, rotary tables, traveling blocks, crown blocks, slush pumps, masts, and prime movers, are also described. *Ideco, one of the Dresser Industries.*

Check No. 18 On The Time-Saver Card

●

All-Flex Ball-Bearing Swivel Pipe Couplings. Six-page catalog 234L includes prices, pressure ratings, and design details on swivel couplings ranging from ⅜ to 10-in. pipe sizes. Positive seal of the multiple metal-backed packings, and low torque characteristics are featured. *H. & N. Manufacturing Corp.*

Check No. 19 On The Time-Saver Card

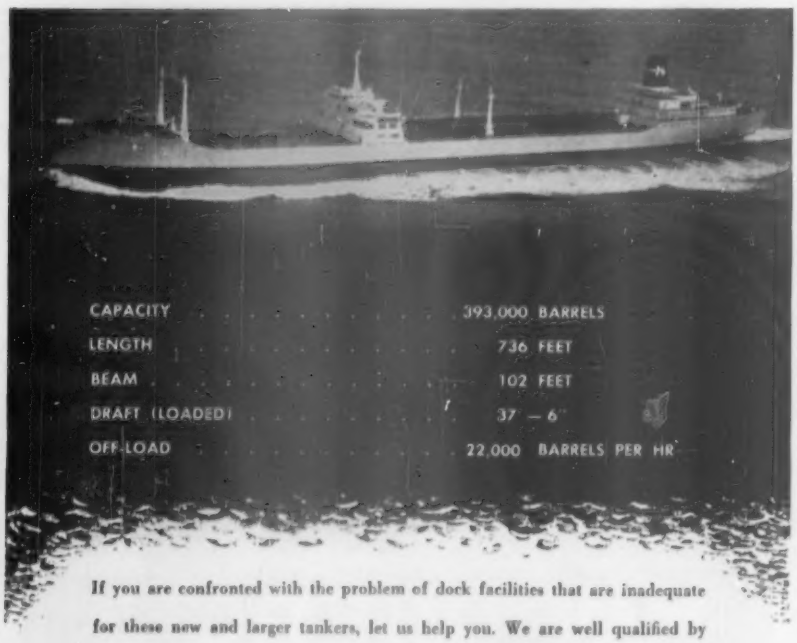
●

Free-Water Knockouts. Catalog 31-11 describes the low-pressure, vertical, free-water knockout Model LK. Highly suitable for processing well streams containing sand and sediment, the LK provides a deep settling section for efficient separation of water. The unit is available with either an adjustable water siphon or float-type dumping mechanism. Using three colors to demonstrate flow, the catalog is well illustrated with photographs, line drawings, charts, and graphs. *Black, Sivalls & Bryson, Inc.*

Check No. 20 On The Time-Saver Card

COULD *YOUR DOCKS* HANDLE THIS *SUPER-SUPER* TANKER?

"World Glory", the new 45,000 ton tanker built by Bethlehem at its Quincy yards.



If you are confronted with the problem of dock facilities that are inadequate for these new and larger tankers, let us help you. We are well qualified by 52 years of world-wide experience in the engineering and construction of harbors, docks and terminals.

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EQUIPMENT MEN . . . in the News

Barrett to Head Byron Jackson Public Relations

ROSS BARRETT

The appointment of Ross Barrett to head an expanded department responsible for public relations, advertising, and sales promotion, has been announced by E. S. Dulin, president of Byron Jackson Co. This department will also supervise market analysis for new BJ products and services.

Barrett has resigned as vice president and director of Foreman & Clark to join Byron Jackson.

Dulin commented on Barrett's appointment by stating that during the past 10 years the company has more than doubled its annual sales volume. The increased manufacturing facilities in the eastern United States and Canada and the accelerated activities in the electronics field present new opportunities in merchandising and selling. Through the newly enlarged department which Barrett will direct, those opportunities are expected to be translated into increased sales volume.

Byron Jackson manufactures centrifugal and turbine pumps, oil-drilling and production tools, industrial rubber products, and electronic instruments, and operates oil-field services.

Grant Will Head Butler's Oil Equipment Division

C. E. GRANT

G. A. BURNS

Charles E. Grant, formerly assistant manager of Butler's oil-equipment division, has been named the new manager, replacing G. A. (Greg) Burns. This has been announced by Glen C. Speakman, vice president in charge of sales.

Burns, after more than 41 years of service with Butler Manufacturing Co., the past 7 years as a vice president, has resigned. He will continue to serve as a vice president and manager of special products division, and handle special assignments for Butler.

Prior to his Butler association, Grant served as sales manager of Chromium Chemical Division of Diamond Alkali Co., Cleveland, and as sales engineer with Bastian-Blessing Co., Chicago. Grant will now administer the sales operations of all four sections of Butler's oil-equipment division: truck tanks and trailers; bolted tanks; liquefied petroleum-gas systems; and welded tanks.

Burns began his Butler career at the company's Minneapolis plant in 1913 and transferred to its general offices in Kansas City, in 1937. Starting as a salesman, Burns advanced to regional sales manager, division manager, and in 1947 was elected a vice president of the company. At various times in his Butler career, he has managed three of the company's five divisions: buildings, special products, and oil equipment.

L. W. Morgan to Represent Alten in Gulf Coast Area

L. W. MORGAN

Lloyd W. Morgan has been appointed Alten sales representative in the Gulf Coast area with headquarters at Shreveport, La., as recently announced by Warren M. Benson, vice president and sales manager, Alten Foundry & Machine Works, Inc., Lancaster, Ohio.

Morgan entered the petroleum-equipment business in 1945 and has spent the entire 10 years in the Arkansas-Louisiana-Texas area with McGriff Sales Co., serving as manager of this company since 1948. Morgan has completed an extended indoctrination period at all Alten plants and field warehouses.

Oilwell Names Two Field Men in Central Midwest

Appointments of Wayne B. Atkins as field representative at Hobbs, N. M., and of Louis R. Roter as field representative at Monahans, Tex., both for U. S. Steel's Oil Well Supply Division, have been announced by William Miskimins, manager of Oilwell's Central Midwest area.

Atkins, who has 14 years' service with Oilwell, moves to his new post from Odessa, Tex., where he served in a similar capacity. Prior to his Odessa assignment, he was located at McCamey, Big Spring, and Snyder, Tex.

Roter was employed by Oilwell in 1948 and since that time has held sales positions at Wichita Falls and Snyder, Tex.

Western Co. Observes Fifteenth Anniversary

H. E. CHILES

The Western Co., Midland, Tex., is this month observing its fifteenth anniversary of providing technical oil-well services to the petroleum industry. The company's complete assets in 1939 totaled only a few thousand dollars in terms of money and capital equipment.

Seagraves, Tex., was selected as the site for the first Western station in 1939 because of the high activity in the Wasson field of south Yoakum County. The company's first acidizing job was performed on the Willard lease about 3 miles north of Denver City, Tex.

In these early days, Western's complete field fleet consisted of two acidizing trucks and one passenger car. Employes totaled four, including President Eddie Chiles who doubled as chief treating engineer.

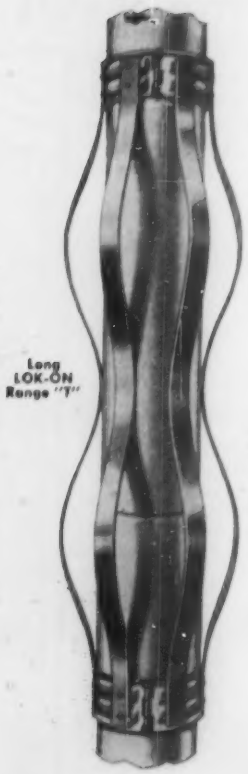
To its basic acidizing, Western added jet and bullet perforating, radioactivity well logging with all its adjuncts, and a complete fracturing service. Today the company boasts a full-scale research and development division with complete laboratories, manufacturing shops, and 54 highly trained specialists. Field-service points are maintained at Seagraves, Levelland, Odessa, Snyder, Borger, Ballinger, Tex.; Hobbs, N. M.; Cushing, Healdton, Okla.; and Ulysses, Kans. The company also has a regional office in Wichita Falls, Tex.

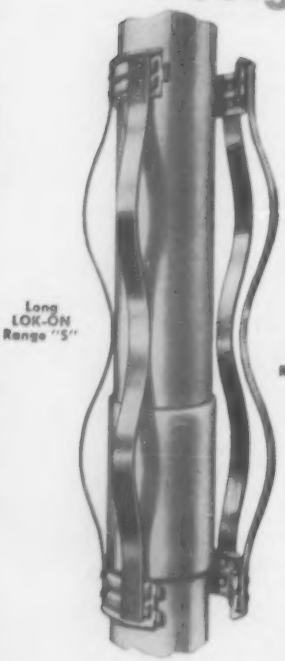
Metal Goods to Sponsor Industrial Metals Clinic

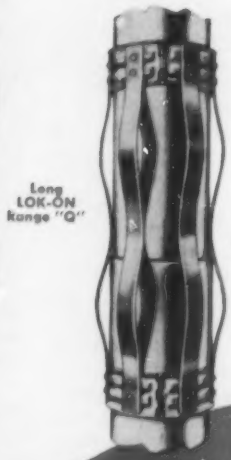
An industrial metals exhibition and clinic, to be held November 17 and 18, at Metal Goods Corp.'s Dallas warehouse, has been announced by Sam D.

Now LARKIN

Designed and proved to meet





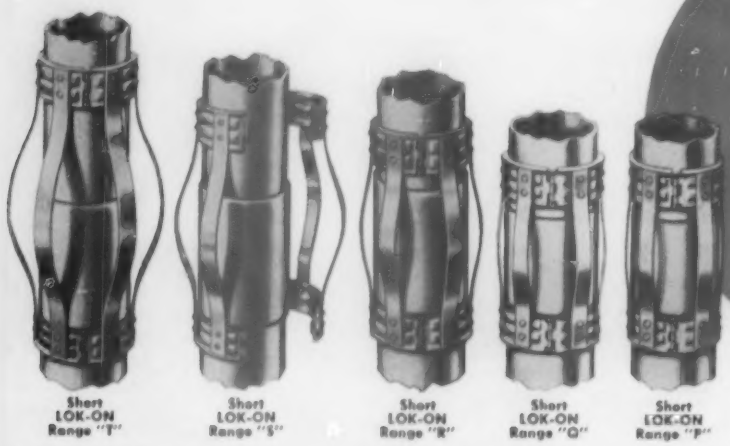


LONG LOK-ON CENTRALIZER

The Larkin Long Lok-On Casing Centralizer exceeds every known requirement for centralizer performance. To install, LOK-ON around the casing coupling. If other positioning is desirable, plug-welding lugs for this purpose are furnished with each centralizer.

SHORT LOK-ON CENTRALIZER

The Larkin Short Lok-On Centralizer is an economical means for centering the shorter strings of casing in undeviated holes. It is being satisfactorily used in many shallow producing areas.



In the development of these superior centralizers, Larkin engaged the services of a firm of consulting engineers with an established record for ability and integrity, and with a wide range of experience in the developing and designing of oil field equipment. The purpose of this step was two-fold:

1. **To bring the benefits of their experience, their technical ability, and their excellent contacts with oil company engineers into co-ordination with the work being done by Larkin's own engineering department.**
2. **In view of confusion arising from contrasting claims, to be able to place before centralizer users, in certified form, an unbiased and well-documented report, that could be accepted on its merits without regard to purely commercial considerations.**

Every test made in the development of Larkin Centralizers was observed by oil company engineers.

The first step in the development of Larkin Casing Centralizers was to consult with the engineering departments of a large list of oil companies and get their views on what should be expected of a high performance centralizer. The many constructive suggestions thus received were consolidated and our engineers set out to design a centralizer that would meet or exceed the maximum stated requirements. After more than three years of research and testing the final design was established and now a centralizer of truly superior performance is available in a series of ranges and types to suit any well condition, any method of installation, (Slip-On or Lok-On), or to satisfy any need for economy.

FIVE RANGES FOR MAXIMUM EFFICIENCY

Maximum efficiency in a casing centralizer requires a carefully calculated relationship, between the bowed height of the spring and the length of the spring. Therefore, the overall length of centralizers in the various ranges will vary with the size of the hole in which casing of a given size is run. The Range "P" might appear to be rather short just as the Range "T" might appear to be unnecessarily long, but each

OFFERS THE FIRST COMPLETE SELECTION OF CASING CENTRALIZERS

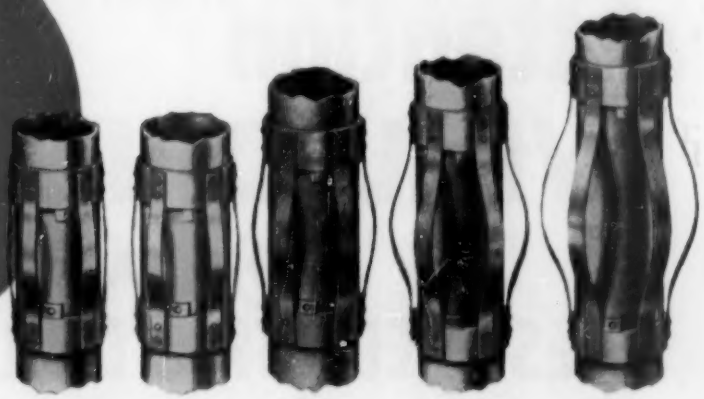
every known requirement

LONG SLIP-ON CENTRALIZER

The Larkin Long Slip-On Casing Centralizer is a counterpart of the Larkin Lok-On with the exception that it is always positioned between the casing couplings rather than around them. Where well conditions or personal preference require this type of installation, it is the ideal centralizer.

SHORT SLIP-ON CENTRALIZER

The Larkin Short Slip-On Centralizer is an economical unit designed for "between the couplings" installation. It is completely satisfactory for use on shorter strings in undeviated holes.



Range is scientifically designed to give the operator what he expects from Larkin Centralizers.

IMPORTANT FACTS ABOUT LARKIN CENTRALIZERS

Larkin Centralizers take 45% less permanent set than the maximum usually allowed.

Larkin Centralizers have 300% more initial centering force than the minimum usually required.

Larkin Centralizers of properly selected range will start easily without bumping or snubbing.

HOW TO ORDER

Refer to Selection Charts in the new Larkin Centralizer Catalog and order by Fig. No., casing size and range.

For complete details write for catalog or contact your nearby Larkin representative.

50th Anniversary Year

LARKIN

...Through Your Supply Store

LARKIN PACKER COMPANY, INC. • ST. LOUIS, MO.

Hodgdon, vice president and district manager of the firm's Dallas office.

The exhibition and clinic is designed to bring the latest technical developments to the attention of metal users. It will feature demonstrations in welding, silver brazing, finishing, pipe and tube fitting techniques, fastening techniques, and mist elimination. There will be exhibits featuring applications of aluminum, brass, copper, nickel, monel, inconel, stainless steel, and steel.

Technicians from Metal Goods and its mills will be on hand to answer questions and give demonstrations. Companies participating are: Aluminum Co. of America, American Brass Co., Armco Steel Corp., Babcock & Wilcox, Handy & Harmon, H. M. Harper Co., Hollander Manufacturing Co., International Nickel Co., Jones & Laughlin, Metal Textile Corp., Parker Appliance Co., Pittsburgh Steel Co., Sawhill Tubular Co., and Tube Turns, Inc.

All users and purchasers of metals in the southwestern area are invited to attend.

McCullough Opens Branch In Rocky Mountain Area

McCullough Tool Co., has announced the recent opening of an additional branch service location at Cut Bank, Mont. Dallas Novak has been appointed branch manager of this new service location.

D. NOVAK

A. SIMPSON

The appointment of Al Simpson as sales engineer at McCullough's Bakersfield, Calif., branch service location has also been announced.

Novak's work with McCullough prior to his recent appointment as branch manager has been in the service department where he has gained a thorough knowledge of all McCullough tools and services. Before joining McCullough, he had been working for International Cementers, Inc., in the shooting department.

Prior to his appointment to the Bakersfield office as a sales engineer, Simpson had been working as a logging engineer and geologist at McCullough's main headquarters at Los Angeles since 1950.

Vinson Supply Opens New Houston Sales Office

HEINZERLING

B. W. Vinson, president of Vinson Supply Co., Tulsa, has announced the opening of a Houston sales office. This is being done in line with Vinson's policy of expanding its sales coverage of the oil and gas industry.

The Houston office will be in charge of John H. Heinzerling who has been with the Vinson organization for 14 years. Previous to that time, Heinzerling was with The Texas Co., Port Arthur, Tex., for 6 years. Heinzerling is past president of Natural Gasoline Supply Men's Association, and has been a vice president of Vinson since 1951.

Vinson Supply's headquarters is located in Tulsa, and warehouses are maintained in Tulsa; Dallas, Odessa, and Amarillo, Tex., with sales offices at Oklahoma City, and Kansas City. Lines represented are National Tube Co., Crane Co., Nordstrom Division of Rockwell Manufacturing Co., Ladish Co., Fisher Governor Co., and Chase Brass Co.

Attention
WELL DRILLERS—
FOR SALE
DIESEL ELECTRIC DRILLING RIG

Like a New Machine: Drilled Only 4 Wells

A COMPLETE RIG IN EVERY DETAIL

2—1000-HP., General Motors Diesel Engines

1—1200-KW., Allis-Chalmers DC Generator & All Auxiliaries

FOR COMPLETE DATA WRITE TODAY

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NEW WALKER-NEER FRAC-SERVICING MACHINE

For More Economical Well Completion in . . . Secondary Recovery

It's "two machines in one"—designed specifically to cut costs of well completion in secondary recovery.

It is a double-drum pulling machine for swabbing, bailing, and sandpumping—equipped with SPUDDING BEAMS to handle any necessary spudder jobs, such as removal of cement from the hole, or fishing.

It's tops in portability . . . truck mounted, or can be trailer mounted.

Both drums have DOUBLE 8-INCH BRAKES. Each drum is powered by a disc-type clutch in end of drum mounted on roller bearings, making it a full-floating drum when going in the hole, with tubing or tools.

Double catheads are started and stopped by one lever at the operator's platform.

The Model C-25, pictured here, has a double telescoping 5½" x 7" tubular mast, and is recommended to 4500 feet. Other models are available, for depths of 2000 to 8000 feet.

Visit, phone, or write us for details.

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MANUFACTURING COMPANY, INC.

WALKER-NEER SPUDDERS AROUND THE WORLD

Iowa Park Road, WICHITA FALLS, TEXAS • P. O. Box 2490 • *Phone 2-5429*

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Sargent

has taken the long stroke unit from the TOP of the hole and placed it at the BOTTOM—

to operate hydraulically the time proved standard bottom hole pump!

Rod Problems and Tubing Wear eliminated

The Pump Unit can be surfaced by turning a valve

Reduces Plunger Bumping Up and Down

High Compression Ratio! This results from correct spacing of the traveling and standing valves, and the long pump stroke. It minimizes gas lock trouble in the production pump, and since the spacing is taken care of when the pump and unit are assembled in the shops, no guess work is necessary during installation or operation.

Simple isn't it?

"GOOD WILL" is the disposition of the pleased customer to return to the place where he has been well treated.
—U.S. SUPREME COURT

Write for details!

Standard of Excellence — *Since 1920*

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TEXAS
Odessa
Snyder
Houston
Sundown
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EXPLORATION

Optimism on the West Coast

by Frank J. Gardner

THINGS have been happening in recent months that should stimulate West Coast operators to optimism and more aggressive thinking along exploration lines. The doldrums occasioned by disappointment in recent years must surely be replaced by the exuberance of discovery if the coastal states are to achieve a rightful status as future oil reserves.

In California, several significant discoveries have been made, each of which is destined to influence exploration. Two of these have to do with depth . . . the "3-D" view of the future in California. A third concerns new lateral expansion into the seas off her shores.

New deep assurances . . . In December 1953, oil flowed from an Eocene sand at 17,497-17,892 ft. at Coles Levee North field, in Kern County, to establish the world's deepest producing reservoir in the southern San Joaquin basin (see map). Despite an unattractive potential at the discovery well, the strike was gratifying reassurance to California geologists who had predicted such deep Eocene pools.

An even more imposing 3-D glimpse of the future was afforded by the world's deepest hole, recently drilled at Paloma field (also in Kern County) to a depth of 21,482 ft., where it was still in Miocene sediments. Here is an area thought to contain the greatest sedimentary thickness on our continent —estimates range up to 65,000 and 75,000 ft. And here was substantiating evidence that the estimates might be right.

How deep can Californians expect to find oil? Some geologists now place depth limits on possible oil existence at 51,300 ft. for limestones and 65,620 ft. for sandstones. Ohio Oil Co., in carrying its KCL-A No. 72-4 to 21,482 ft., penetrated one-third of the maximum depth. The fact that no oil was found must be considered more ill luck than condemnation, for the next deep test **might** make an oiler at such a depth. On the other hand, perhaps the extremely tight sands and hard shales found below 20,000 ft. at Paloma are indicators that we are approaching the limit of commercial oil production.

In any case, the deep-probing activities in the southern San Joaquin Valley have revealed the existence of oil pools far below present producing levels in most California fields, and it is these deeply buried reservoirs that will provide much of the state's future oil reserves.

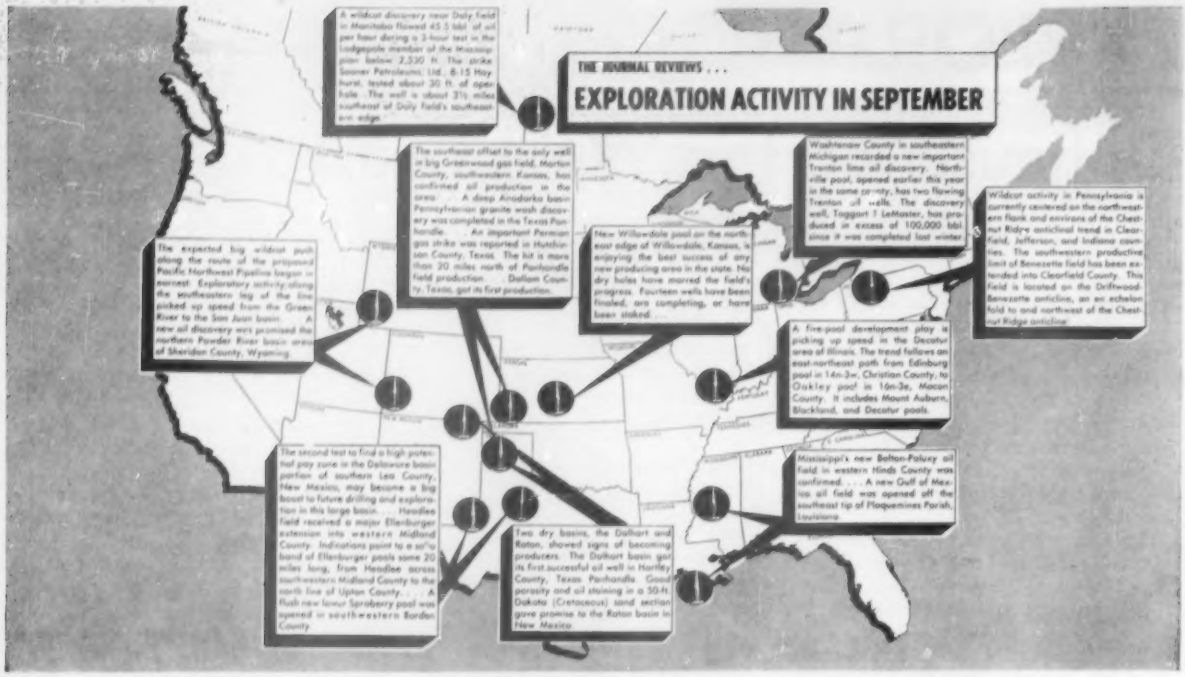
Offshore success . . . As meaningful to California as the deep-drilling campaigns was the recent completion of the first oil well off her shores. Monterey Oil Co. and The Texas Co. 3 State, 1½ miles offshore from Seal Beach (A on map) was finished for 300 bbl. per day, flowing from 5,906-6,280 ft., after drilling vertically to 10,162 ft. without finding the basement rocks anticipated at 7,000 to 9,000 ft.

New deep reservoirs in California basins combine with offshore potentialities to provide optimistic outlook for the state. The known basins and potential oil areas of Washington and Oregon offer future exploration promise.

On the map, the shaded portion off the coast of southern California is the area considered to offer the best hope of offshore oil fields. It can be seen from this map that all three of the producing basins of southern California (Santa Maria, Ventura, and Los Angeles) border the coast line. They are believed to continue seaward for some distance, with the same structural trends, the same reservoir sands, and the same complex sand problems. While her offshore prospecting area is considerably smaller than that of Texas or Louisiana, California can look forward to new exploration there, and probably millions of barrels of new submerged oil reserves.

Virgin states . . . The northwestern states, Washington and Oregon, after intermittent exploration attempts, have registered only oil showings and uneconomic gas pools (see map). These are indications, however, that some day these two states are going to be added to the oil-producing column. Each of them has the necessary requirements for oil fields—sedimentary basins, oil and gas showings, and extremely sparse testing. Drilling density in western Oregon is only one well per 66 sq. miles; in Washington, drilling density is one well per 298 sq. miles. Compare these figures to the drilling density of one well per 1.1 sq. miles in the Los Angeles Basin, and it will be readily apparent that the areas of prospective oil territory in the two states to the north, as outlined on the map, have been neglected in the West Coast oil search.

There are good reasons, then, for optimism on the West Coast. The lure of offshore development, the proven presence of deep reservoirs, and the existence of yet-untested provinces will provide the incentive for new California exploration, while the virgin states of Washington and Oregon await only an exploratory program based on the same kind of courage, expenditure, and luck that brought remote Nevada into the oil picture this year.


THE JOURNAL REVIEWS . . .
EXPLORATION ACTIVITY IN SEPTEMBER
A wildcat discovery near Daly field in Manitoba flowed 45.5 bbl. of oil per hour during a 3-hour test in the Ladyside member of the Mississippian below 2,530 ft. The strike Sooner Petroleums Ltd., B-15 Hayhurst, tested about 30 ft. of open hole. The well is about 3½ miles southeast of Daly field's southeastern edge.
The southeast offset to the only well in big Greenwood gas field, Morton County, southwestern Kansas, has confirmed oil production in the area. . . . A deep Anadarko basin Pennsylvanian granite wash discovery was completed in the Texas Panhandle. . . . An important Permian gas strike was reported in Hutchinson County, Texas. The hit is more than 20 miles north of Panhandle field production. . . . Dallam County, Texas, got its first production.
Washtenaw County in southeastern Michigan recorded a new important Trenton oil discovery. Northville pool, opened earlier this year in the same vicinity, has two flowing Trenton oil wells. The discovery well, Taggart 1 LeMaster, has produced in excess of 100,000 bbl. since it was completed last winter.
Wildcat activity in Pennsylvania is currently centered on the northwestern flank and environs of the Chestnut Ridge anticlinal trend in Clearfield, Jefferson, and Indiana counties. The southwestern productive limit of Benezette field has been extended into Clearfield County. This field is located on the Driftwood-Benezette anticline, an en echelon fold to and northwest of the Chestnut Ridge anticline.
The expected big wildcat push along the route of the proposed Pacific Northwest Pipeline began in earnest. Exploratory activity along the southeastern leg of the line picked up speed from the Green River to the San Juan basin. . . . A new oil discovery was promised the northern Powder River basin area of Sheridan County, Wyoming.
New Willowdale pool on the northeast edge of Willowdale, Kansas, is enjoying the best success of any new producing area in the state. No dry holes have marred the field's progress. Fourteen wells have been finaled, are completing, or have been staked.
A five-pool development play is picking up speed in the Decatur area of Illinois. The trend follows an east-northeast path from Edinburg pool in 14n-3w, Christian County, to Oakley pool in 16n-3e, Macon County. It includes Mount Auburn, Blackland, and Decatur pools.
The second test to find a high potential pay zone in the Delaware basin portion of southern Lea County, New Mexico, may become a big boost to future drilling and exploration in this large basin. . . . Headlee field received a major Ellenburger extension into western Midland County. Indications point to a so'n band of Ellenburger pools some 20 miles long, from Headlee across northwestern Midland County to the north line of Upton County. . . . A flush new lower Spraberry pool was opened in southwestern Borden County.
Two dry basins, the Dalhart and Raton, showed signs of becoming producers. The Dalhart basin got its first successful oil well in Hartley County, Texas. Panhandle Good porosity and oil staining in a 50-ft. Dakota (Cretaceous) sand section gave promise to the Raton basin in New Mexico.
Mississippi's new Bolton-Pelucy oil field in western Hinds County was confirmed. . . . A new Gulf of Mexico oil field was opened off the southeast tip of Plaquemines Parish, Louisiana.

Autumn Opens With New Basin

by John C. McCaslin

WHEN a basin is opened to oil production all other discoveries take a back seat. Texas, the state of many basins and many producing areas, began the cool season with the debut of oil in the Dalhart basin.

Texas and the western Rocky Mountain areas stole the exploratory show during September, but wildcatters from Pennsylvania to the Gulf of Mexico came up with some significant strikes, too. The nation's operators continue to put down a record number of holes, piling up an all-time total footage record. There are fewer wildcats being completed this year, but the test holes are steadily becoming deeper.

Texas Highlights

Dalhart basin . . . Standard Oil Co. of Texas had the distinction of finding first production in this small remote basin of far northwestern Texas.

The 1 Ernest Guilloud, Sr., 12 miles southwest of Hartley, installed pump after swabbing 125 bbl. of oil and 40 bbl. of water in 33½ hours from perforations at 6,174-86 ft. in the Pennsylvanian granite wash. The basin opener is on the northeastern flank of the Bravo dome on the southeast rim of the basin. It is about 22 miles northwest of nearest production at Channing field.

West Texas area . . . The search for deep Ellenburger production in this vast region continued its exciting pace.

Excitement hit along a 40-mile trend southeast of Headlee field after British-American Oil Producing Co. et al 1 Parks extended Headlee field into western Midland County. The well was good for 740 bbl. of oil per day from deep Ellenburger pay. The strike is expected to double the previous estimated area of the field. At month's end the search was concentrated at Forest Oil Corp. and Cities Service Oil Co. 1 Dora Roberts B-1. A new pool here is assured. The 40-mile trend of interest extends to the southeast to Sweetie Peck and Pegasus. The west side of the Midland basin is in for some real discoveries in the coming weeks.

A flush new Spraberry pool joined the ranks during the month in southwestern Borden County. Phillips Petroleum Co. 1 Quartz reported an initial potential of 864 bbl. of oil per day. The wildcat is in an area where exploratory work this year has netted two Spraberry discoveries, one Wolfcamp, and one Pennsylvanian. Nearest Spraberry production is in Jo-Mill pool to the northeast.

Southeast New Mexico . . . Continental Oil Co.'s 2 Bell Lake Unit, 1 mile north of the No. 1 well in Lea County, which blew out and burned last spring, gaged 10,000 M.c.f. of wet gas per day on test of the lower Wolfcamp(?).

The original well in the area, the only deep test to indicate good production, renewed interest in the Delaware basin after it gaged an estimated 100,000 M.c.f. of gas per day prior to its blowout. Much interest hangs on the completion of the 2 Bell Lake Unit. Known geology of the Delaware basin will be considerably fortified and its areal limits stand to be corrected through drilling of these wildcats.

Rocky Mountain Report

Wildcat activity along the southeastern leg of the proposed Pacific Northwest Pipeline picked up speed. A drilling spree is in evidence all along the line from the Green River to the San Juan basin.

The Green River basin got three new Mesaverde gas strikes; two in Wyoming, one in northwestern Colorado. The Paradox basin of southwestern Colorado came up with a Pictured Cliffs sand gas strike southwest of South Red Mesa. A Point Lookout gas hit was reported in Archuleta County, Colorado. By October 1, 70 tests were under way along the pipeline's route from Wyoming to New Mexico. La

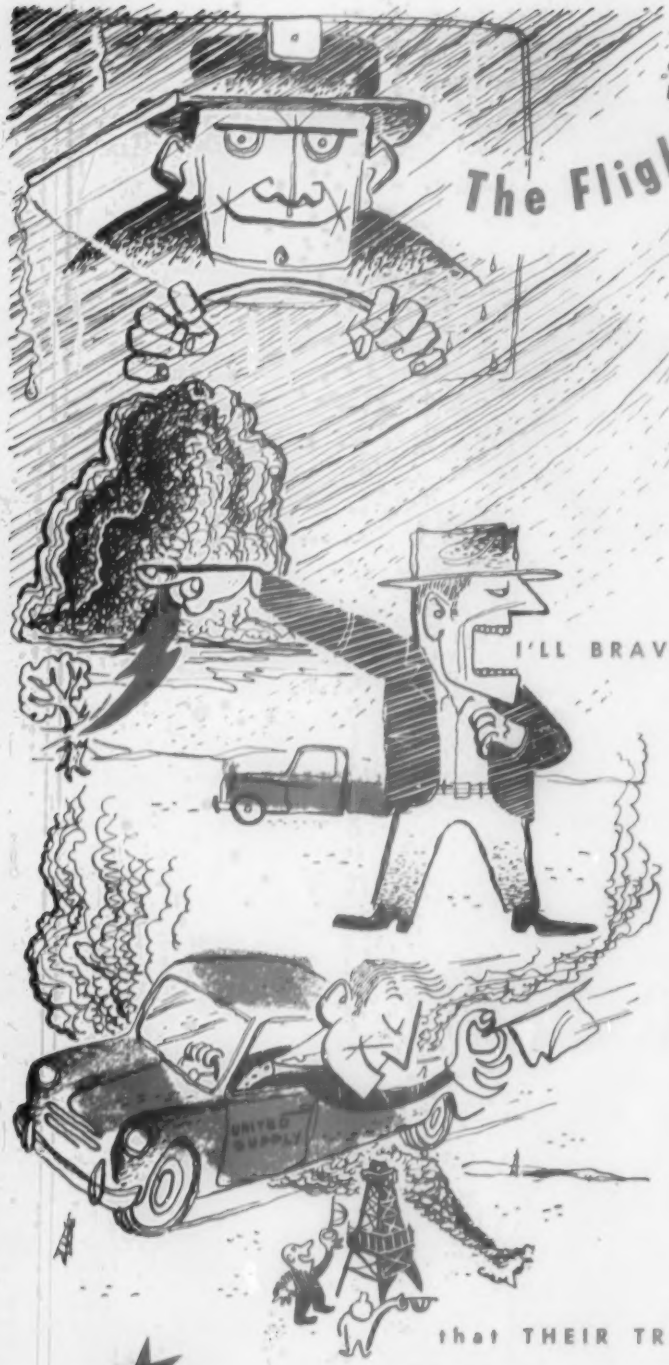
Total September Completions, Exploration and Development

	Total comp.	Oil	Gas	Dry	Under 2,500 ft.	2,500-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	10,000-12,500 ft.	Over 12,500 ft.	Total footage	Active operations
Ala.-Ga.-Fla.	7	0	0	7	0	2	5	0	0	0	37,434	10
Arkansas	65	36	1	28	21	33	11	0	0	0	216,995	39
California	193	132	4	57	51	74	37	15	11	5	883,471	207
Colorado	100	29	2	69	0	33	64	3	0	0	538,115	107
Illinois	284	153	0	131	151	133	0	0	0	0	682,548	476
Indiana	88	40	3	45	76	12	0	0	0	0	131,059	84
Kansas	414	212	27	175	40	363	11	0	0	0	1,459,267	362
Kentucky	99	28	26	45	64	35	0	0	0	0	204,172	146
Louisiana	328	219	19	90	157	25	34	53	37	22	1,707,446	279
North	212	149	13	50	151	17	23	17	4	0	638,805	60
South	116	70	6	40	6	8	11	36	33	22	1,068,641	219
Michigan	40	17	0	23	21	18	1	0	0	0	100,203	140
Mississippi	33	11	0	22	1	1	25	5	1	0	213,246	56
Montana	40	12	3	25	14	12	8	4	2	0	172,529	52
Nebraska	59	38	0	21	2	13	44	0	0	0	326,794	44
New Mexico	86	36	34	16	19	36	24	3	2	2	376,601	103
New York	30	15	1	14	28	2	0	0	0	0	46,000	20
North Dakota	25	14	0	11	0	7	2	14	2	0	176,729	44
Ohio	104	35	27	42	63	41	0	0	0	0	202,912	167
Oklahoma	757	431	39	287	298	320	57	70	8	4	2,543,311	650
Pennsylvania	105	24	42	39	56	11	36	2	0	0	423,768	157
South Dakota	5	0	0	5	0	5	0	0	0	0	18,883	1
Texas	1,306	752	74	480	352	439	316	150	35	14	6,005,728	1,194
N. Central (7-B & 9)	456	226	8	222	220	152	76	7	1	0	1,439,976	310
West (7-C & 8)	318	242	5	71	37	103	98	48	21	11	1,839,765	358
Panhandle (10)	96	55	31	10	18	71	3	3	1	0	319,517	49
East (5 & 6)	69	28	8	33	9	21	35	3	1	0	400,320	103
Gulf Coast (2 & 3)	179	99	11	69	10	41	56	61	8	3	1,174,769	213
Southwest (1 & 4)	188	102	11	75	58	51	48	28	3	0	831,381	161
Utah	7	0	0	7	1	4	2	0	0	0	30,842	39
West Virginia	58	12	38	8	33	25	0	0	0	0	150,344	187
Wyoming	78	51	8	19	16	16	42	4	0	0	379,808	183
Miscellaneous	§1	1	0	0	0	0	0	0	1	0	10,358	§4
Total September 1954	4,312	†2,298	348	*1,666	1,464	1,660	719	323	99	47	17,038,563	‡4,751
Total August 1954**	4,658	2,534	352	1,772	1,505	1,743	860	353	154	43	19,031,456	4,682
Cumulative 1954**	40,052	22,281	2,963	14,808	12,523	15,645	7,372	2,921	1,156	435	163,565,958	
Cumulative 1953	36,301	18,826	2,860	14,615	10,950	14,900	6,403	2,664	1,057	327	148,106,619	
Western Canada	154	81	11	62	32	88	20	13	1	0	609,975	
Alberta	64	36	9	19	6	27	18	12	1	0	316,911	
Saskatchewan	54	28	1	25	10	42	1	1	0	0	194,931	
Manitoba	34	17	0	17	16	17	1	0	0	0	89,283	
B.C.-N.W.T.	2	0	1	1	0	2	0	0	0	0	8,850	
Cumulative 1954	1,507	858	112	537								

*Incl. 73 service wells: Kans. 2, N. Y. 13, Ohio 7, Okla. 33, Pa. 17, Tex. Gulf 1. †Incl. 47 condensate wells: N. La. 1, S. La. 12, Okla. 9, Tex. Panhandle 1, Gulf Coast 15, S.W. Tex. 9. ‡Incl. all wells rigged up and/or drilling at month's end. §Incl. Tenn. 1, Nev. 3. **Revised.

. . . and the Month's Wildcats

	Total	Oil	Gas	Dry	Footage	1954 Comp.	1954 (1,000 ft.)	1953 Comp.	1953 (1,000 ft.)
Ala.-Ga.-Fla.	7	0	0	7	37,434	79	439	88	480
Arkansas	17	1	0	16	61,093	120	481	99	335
California	45	5	1	39	209,197	434	2,086	495	2,386
Colo.-Utah-Wyo.-Mont.	99	5	5	89	526,336	731	4,109	499	2,792
Tri-States	59	9	0	50	120,517	*557	*1,100	739	1,458
Kansas	71	9	4	58	292,302	539	2,124	681	2,571
Louisiana	47	13	2	32	394,550	413	3,779	381	3,389
North	23	2	0	21	126,927	136	786	121	717
South	24	11	2	11	267,623	277	2,993	260	2,672
Michigan	15	0	0	15	37,274	174	393	200	484
Mississippi	15	2	0	13	98,441	122	845	150	1,070
Nebraska	14	3	0	11	71,747	117	610	126	642
New Mexico	9	0	1	8	54,421	112	772	119	787
North Dakota	11	0	0	11	58,236	83	433	54	298
Oklahoma	96	15	2	79	423,405	621	2,655	596	2,600
South Dakota	5	0	0	5	18,883	18	88	15	76
Texas	346	48	13	285	1,769,003	3,994	19,760	4,058	19,882
North Central	122	11	2	109	392,702	1,589	5,525	1,651	5,883
West	64	10	3	51	398,379	757	4,597	670	4,003
Panhandle	7	2	1	4	57,050	75	434	20	102
East	26	1	0	25	130,748	247	1,276	234	1,184
Gulf Coast	65	12	3	50	499,179	642	4,740	674	4,831
Southwest	62	12	4	46	290,945	684	3,188	809	3,879
Others	16	1	5	10	77,294	110	487	78	306
Total September 1954	872	111	33	728	4,250,133	8,224	40,161	8,378	39,556
*Total August 1954	1,089	162	45	882	5,220,033				
*Cumulative 1954	8,224	1,172	289	6,763	40,160,732	8,224	40,161		
Cumulative 1953	8,378	1,224	290	6,864	39,555,937			8,378	39,556
*Revised									
Western Canada	70	9	6	55	267,841				
Cumulative 1954	536	72	53	411					



The Flight of Elmer Quillback

You've all heard the story of Paul Revere
and his famous ride at night
But listen, my friends, and you shall hear
of another famous flight.

Elmer Quillback drove a pick-up truck
for United Supply—no less!
He worked very hard to earn every buck
and make himself a success.

He drove supplies to oil field rigs
to keep them makin' hole—
it took a lot of thingamajigs
to keep them under control.

One night his big chance came
just as he was quittin' work
A Judson county rig was lame
the engine wouldn't perk.

You can count on me, said Elmer,
to deliver the parts, I'm proud
to serve United's customer—

I'LL BRAVE YON THUNDER CLOUD!"

They loaded the parts in nothin' flat
and Elmer began to roll—
on safety he always stood pat
as he sped toward his goal.

It was a night that really wasn't fit
for man or even beast—
and when the big storm really hit
Elmer just kept headin' East.

He knew United's slogan well
"You can rely on United Supply"
to look at his face you could tell
that to him it was do or die.

Suddenly his truck took off the ground
up into a funnel-shaped cloud.
The roar of the wind made a terrible sound
and Elmer sang out loud.

'Off we go into the wild blue yonder"
His voice rang clear and true
But his mind would never wander
from the job he had to do.

Now his truck began to descend
and Elmer saw his final goal
He knew he'd be a godsend
to the drillers waitin' at the hole.

As he touched the ground he heard a cheer
from the drillers shouting for joy.
"The supplies are already here—
they'll really be proud of this boy!

Now we know that the service is keen
that you get from United Supply
But Elmer Quillback proved what they mean

that THEIR TRUCKS COME ON THE FLY!

YOU CAN RELY ON UNITED SUPPLY!
UNITED SUPPLY
COURTESY • SERVICE • DEPENDABILITY

UNITED SUPPLY

AND *Manufacturing* COMPANY
TULSA, OKLAHOMA
Stores in KANSAS, OKLAHOMA, TEXAS, LOUISIANA, AND NEW MEXICO
COURTESY • SERVICE • DEPENDABILITY

Plata County, Colorado got a good Dakota gas discovery.

Ash Creek . . . A Sheridan County, Wyoming wildcat promised a new field for the rank northern area of the Powder River basin.

Shell Oil Co. recovered 3,760 ft. of clean, gassy oil on test of the Ash Creek (Cretaceous) sand at 1 Hullworth. The Decker area wildcat is about 2½ miles southeast of Ash Creek field, an important 1952 discovery which established stratigraphic possibilities in the northern Powder River basin.

Other Highlights

Panhandle-Hugoton . . . This area retained its continual Mid-Continent first place.

Phillips 1 Delp, one of the best strikes of the year in the area, was completed flowing 257 bbl. of oil per day through ¼-in. choke from granite wash perforations. The Gray County discovery is the third deep hit in this sector of the Anadarko basin. Phillips 1 Hobart, 10 miles northwest, produces from granite wash as does Gulf 1 Haggard in Quinduno-lower Albany dolomite field 12 miles northwest.

Phillips 1 Ivy "A", 10 miles south of Hansford, Tex., flowed 3,205 M.c.f. of gas per day from the white Permian dolomite to become the third Permian producing area in the Panhandle. The Permian well is 1 mile southeast of North Hutchinson-Pennsylvanian field. Nearest big production is in new Gruver gas field 13 miles to the north.

Dallam County, Texas, got its first gas production at Humble Oil & Refining Co. 1 Sheldon, 3 miles southwest of Kerrick. The Cisco discovery flowed an estimated 2,000 M.c.f. per day. It is 7 miles west of new four-well Stratford-Cisco field of Sherman County.

Gulf Coast-Southeast . . . Shell Oil Co. discovered another Gulf of Mexico oil field at State Lease 1012 in Block 28, South Pass, Plaquemines Parish, Louisiana.

The discovery well was rated good for 215 bbl. of oil per day. The location is more than 1½ miles southeast of South Pass Block 24 field, opened by Shell in 1950, one of the most extensively developed and prolific fields in the gulf waters. The new well is in open water 5 miles from land.

Sun Oil Co. has an indicated confirmation to new Bolton-Paluxy field in Hinds County, Mississippi, at its 1 Lancaster-McAlpin Unit, the south offset to the field discovery. The field has four additional tests under way, including a north offset to the field opener by Magnolia, a west offset by Stanford-Wells-Lutken, an east offset by Larco, and a southwest diagonal offset by Sun.

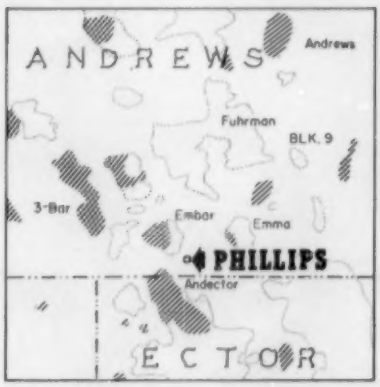
TEXAS

WEST TEXAS

New Completion Potential Filed On Discovery

Forest Oil Corp. and Cities Service Oil Co. 1 Roberts B-1, Midland County Ellenburger discovery, received another acid treatment in open hole between 12,845-13,012 ft., and following that it made a new flow test for completion gage.

The new production figure on the well is 2,168.8 bbl. per day, based on a flow of 540.7 bbl. of oil in 6 hours through 1-in. choke. Flowing pressure was 450-400 psi.



Phillips Petroleum Co. 3-B Embar, in southern Andrews County, flowed 87 bbl. of oil in 2½ hours on a drill-stem test in the Devonian at 9,348-92 ft. The flow was through ⅝ and 1-in. chokes, under pressure of 2,000 psi. Sample top on the Devonian was 8,893 ft. on elevation of 3,233 ft. Shaded portions of pools shown are pre-Permian areas.

First Ellenburger failure . . . Forest and Cities Service 2 Roberts C-4, 46-41-T3S-T&P, located in the Warsan area, is the first well on the Roberts ranch to find the Ellenburger barren. However, the Pennsylvanian produces in this sector and operators were testing in that formation.,

On drill-stem test of perforations at 10,772-10,782 ft. the well had flowing oil in 90 minutes, and gaged 27 bbl. of oil in 24 hours. The well made a better showing on perforations between 10,400-10,468 ft., where it gaged 48.78 bbl. of oil in 3 hours through ⅝ and 1-in. chokes, after cleaning for 3 hours and 20 minutes. Tubing pressure was 150 psi., gas-oil ratio was 1,955 cu. ft. and gravity of the oil was 43.7°. There was no water in the drill pipe.

In northern Midland County, Gulf Oil Corp. 1 Scharbauer Cattle Co. was showing for a multi-pay discovery, including the Pennsylvanian, Simpson and Ellenburger.

Top of the Ellenburger by samples was 12,714 ft., and on test at 12,713-12,763 ft. the well flowed gas in 7 minutes and fluid in 6 hours. The well then made an intermittent flow, being 13.11 bbl. of oil the first hour, none the second hour, 13.8 the third, 6.21 bbl. the fourth, 1.38 bbl. the fifth hour and none the sixth hour. Operators believed the testing tool was plugged. Total oil flowed in 6 hours was 34 bbl.

A drill-stem test in Simpson sand at 12,615-12,699 ft. had gas in 9 minutes and oil in 3 hours and 50 minutes, which flowed 48 bbl. of 52° oil in 7 hours. Flowing pressure was 1,850 psi. and 30-minute shut in pressure reached 3,300 psi. Sample top on the Simpson was 12,540 ft. Elevation is 2,838 ft.

This well also flowed gas and recovered distillate on a drill-stem test in the Pennsylvanian at 10,432-10,507 ft.

Location is 6 miles north of U. S. Smelting 1 King, Ellenburger failure which had shows of oil in Simpson sand, and 2½ miles northwest of Pennsylvanian production in the Hoffercamp area.

Third Cambrian field . . . Completion of C. L. McMahon, Inc. 1-A Hendry, 3 miles southeast of Blackwell, has given Coke County its third Cambrian pool. Potential, on the pump, was 83.52 bbl. of 45.5° oil a day, from open hole at 5,712-27 ft. Top of Cambrian sand pay was 5,722 ft. on elevation of 2,014 ft.

SOUTHWEST TEXAS

Almond Field Extension Opens Deeper Pay Zone

Production in Almond field, Jim Wells County, has been extended approximately 1,920 ft. westward with a new-pay discovery by Associated Oil & Gas Co. at its 2-A Almond.

The well, testing the Frio-Stillwell sand, perforated at 5,255-65 ft., approximately 2,250 ft. deeper than the field's present gas-producing 3,220-ft. sand, flowed an ungaged volume of gas and condensate with 1,450-psi. pressure through ¼-in. choke.

Additional production was indicated in the 3,200-ft. sand, as well as in at least six other zones.

The company is starting another step-out test, 3-A Almond, about 6,000 ft. southwest of the new well.

Frio Discovery on Pump

Theljohn Oil Co.'s new discovery well 4 miles northeast of Big Foot, in northeastern Frio County, pumped 36.45 bbl. of 42°-gravity oil during a 24-hour potential production test. The well, drilled to 2,429 ft., is producing from a casing-perforated interval at 2,402½-05½ ft. The discovery has been designated as Sleepy Creek field.

Fifth Well Completing In New West Alice Field

L. M. Lockhart is completing another good producer in the recently discovered West Alice field, 3 miles west of Alice, in Jim Wells County. Although no gage was reported, the well, 1 Huegle, flowed oil while cleaning, recording pressures of 600 psi. on tubing, and 725 psi. on casing. Production is from the field's original and main pay zone, Stillwell sand, with perforations at 4,590-4,606 ft.

This is the fifth producer in the field, opened last August. Four wells produce from the 4,590-ft. Stillwell zone. The other was completed in a deeper pay at 5,144-52 ft.

TEXAS GULF COAST

New Vicksburg Producer Completed at Raywood

General Crude Oil Co. has completed another Vicksburg oil producer in the steadily developing Raywood field, 1 mile southwest of Raywood, in Liberty County.

The new well, 6 Morris, flowing 180 bbl. of 35.7°-gravity oil per day through 7/64-in.

SLURRY OIL SQUEEZE

New DOWELL SERVICE is designed to control water production in oil and gas wells

SOS* (Slurry Oil Squeeze) is a new Dowell cementing service designed to stop undesirable water production quickly. It has proven highly effective in both oil and gas wells in almost every type of formation.

The slurry used in SOS consists of portland cement, a special Dowell surface tension reducing agent, and a non-aqueous carrying medium like diesel oil or kerosene. The cement will not set up in the presence of the non-aqueous carrying medium or the crude oil contacted in the pay. It will readily set up when contacted by formation water.

The entire batch of SOS slurry is pre-mixed in truck-mounted, paddle-mixing tanks. This method provides a smooth oil-cement slurry of any density the operator desires. Then high-pressure, triplex pumps are used to inject the slurry into the formation.

Here's proof that SOS pays off! Dowell engineers were called when a well tested several hundred barrels of salt water daily, with only a trace of oil. After SOS, the well produced 40 BOPD and no water. Another well was producing 30 BOPD and 30 BWPD. An SOS treatment stopped all water production. The well still made 30 BOPD.

For full information on Slurry Oil Squeeze call your nearest Dowell office or write DOWELL INCORPORATED, Tulsa 1, Oklahoma, Dept. J-11.

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choke, makes four producers from that horizon, opened last April. Producing interval is 7,596-99 ft. per barrel.

The field, discovered in March 1953, has five adidtional wells productive of gas or gas and condensate from Cook Mountain sands below 11,000 ft.

Oil Discovery Indicated In Jackson County Test

Discovery of a new oil-productive area in southern Jackson County is indicated by showings encountered in a wildcat test, 1 State-Tract 7, drilled by Highland Oil Co., of Houston.

Best reported showings were in a sand interval at 8,065-72 ft., where a 23-minute drill-stem test through ¼-in. chokes recovered 870 ft. of clean 38°-gravity oil with bottom-hole flowing pressure of 3,450 psi.

With hole drilled to 8,476 ft., casing has been run through that interval and a lower sand at 8,400 ft. to 8,468 ft. for production tests.

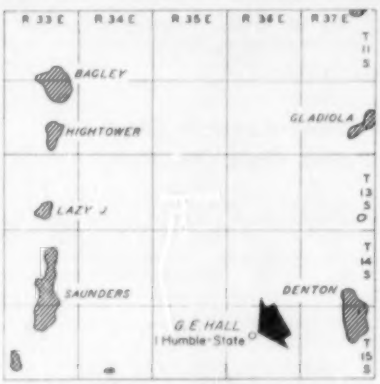
The discovery is 1½ miles northwest of Swan Lake field but separated from that field by dry holes. Location is 9 miles northeast of Port Lavaca, in northern Calhoun County.

NEW MEXICO

SOUTHEAST NEW MEXICO

Devonian Well Completed West of Denton Field

A Devonian discovery 8 miles west of the southern tip of Denton field has been completed for a flowing potential of 859 bbl. of oil a day. The new well is G. E. Hall et al 1 Humble-State "A," in 16-15s-36e, 5 miles north and 2 miles east of Lovington. The



initial potential was through ½-in. choke from perforations at 13,463-13,510 ft. Sample top on the Devonian was 13,413 ft.

Continental Oil Co. 2 Bell Lake Unit, 30-23s-34e. Lea County, has been perforated from 12,936-12,942, 12,948-12,954 and 12,960-12,966 ft., for production tests in Wolfcamp limestone. No. 2 Bell Lake is 1 mile north of the company's original gas discovery.

Continental 1-A Bell Lake, twin well to 1 Bell Lake which blew out and eventually had to be plugged, was drilling below 12,400 ft. at last report.

Eddy County . . . Two Delaware sand discoveries were finaled last week. Ibex Co. 1 Hanson-Federal, 25-26s-31e, flowed 44 bbl. of 42° oil a day through ¼-in. choke, from open hole at 4,140-47 ft. Location is 1½ miles north of Delaware production in North Mason field in Loving County, Texas.

Richardson and Bass 1 Beeman, 2-24s-28e, 1½ miles northeast of Malaga and the same distance northwest of Delaware production in Malaga field, completed on the pump for 25 bbl. of oil a day, plus 18 bbl. of salt water. Production was from 4,658-4,805 ft.

LOUISIANA

SOUTH LOUISIANA

Lake Washington Field Gets Deeper Production

Production of Lake Washington field, in Plaquemines Parish, has been extended 3,800 ft. northeast and to a new deep sand, the deepest in the field so far.

The extension well, 1 LL & E, drilled by John W. Mecom and Freeport Sulphur Co., flowed at the rate of 405 bbl. of 48.9°-gravity condensate with 1,325,000 cu. ft. of gas per day during tests through 9/64-in. choke. It had flowing pressure of 4,050 ft.

Producing interval is at 15,131-38 ft. in 50 ft. of indicated productive sand. Hole, bottomed at 16,281 ft., is the second deepest drilled in or around the field. Deepest test, a dry hole, located on the west flank of the dome, was drilled to 17,000 ft.

Oil Production Opened In Laurel Ridge Gas Field

Laurel Ridge field, productive of gas and condensate since 1944, got its first oil well last week.

F. A. Callery, Inc., 1 Canal Assets Co., Inc., located on the east side of the field, in

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NOW you can hike profits on your gas distiliate wells — large or small — with Russco's miniature gasoline plants. Designed to solve your particular problems, the Micro-Plant and Super-Knockout installations are fully automatic . . . require minimum operating attention . . . and can be economically moved from one lease to another.

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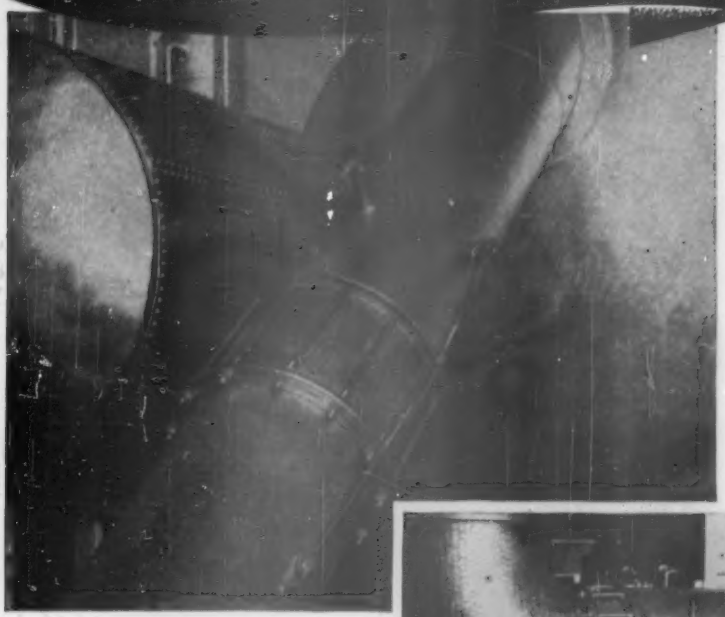

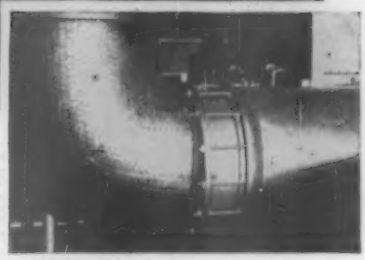

TOP—20" Style 38 Dresser Coupling installed on field gas scrubber line. BELOW—24" coupling in gas-treating plant.

On machinery and tank hookups—at the well or anywhere in-between—the handiest, surest way to get uniformly tight pipe joints is with Dresser Couplings or Long Sleeves.

There's no pipe threading—the only tool you need is a wrench. Dresser Couplings give you bottle-tight connections every time—day or night, rain or shine—even when pipe ends don't meet.

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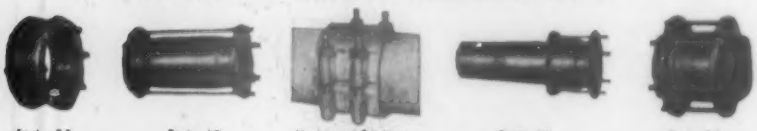

Style 38 Coupling | Style 40 Long Sleeve | Hydrepair* Asbestos Cement Pipe Clamp | Style 63 Expansion Joint | Style 39 Insulating Coupling

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69-10s-14e, flowed at the rate of 216 bbl. of 35.2°-gravity oil per day through ⅛-in. choke. It had flowing pressure of 1,775 psi. and gas-oil ratio of 1,078 cu. ft. per barrel.

Production is from sand interval at 10,109-113 ft.

The field, located 3 miles southeast of White Castle, in Iberville Parish, was discovered by Humble Oil & Refining Co., which drilled five productive wells before suspending development in 1947. No additional wells were drilled until early this year when F. A. Callery, Inc., drilled his first well, extending gas-condensate production a mile south. Gas and condensate production is from sands at 10,700 ft. and 10,200 ft., both Miocene.

Deeper Pay Zone Proved By Lake Arthur Outpost

Union Sulphur and Oil Corp. has a new deep-sand discovery and extension well at its Lake Arthur (North) field, in Jefferson Davis Parish.

The new well, 10 TRS Farms, moves production 3,000 ft. out from the nearest well on the northwest flank of the deeply seated salt-dome structure. Production, rated at 3,300,000 cu. ft. of gas and 70 bbl. of 48.6°-gravity condensate daily through 12/64-in. choke, is from a casing-perforated interval at 10,774-82 ft. in 83 ft. of Marginulina Texana sand. Flowing pressure was 3,800 psi.

The pay zone, new to the field, is the deepest of six potentially productive sands in the well.

The field, discovered by Union Sulphur in 1937, now has 18 productive wells.

NORTH LOUISIAA

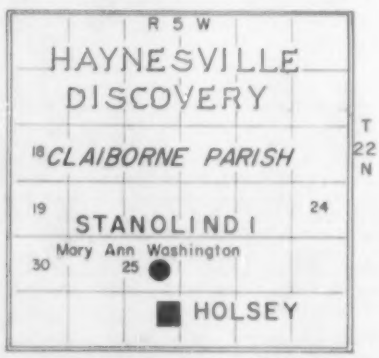
New Well Reported At Bethany-Longstreet

Jack W. Grigsby 1 estate, 10-13n-15w, 5 miles southeast of Bethany-Longstreet Pettit production, DeSoto Parish, flowed open 32,500 M.c.f. of gas per day.

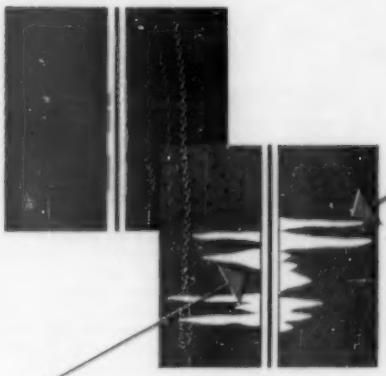
Holsey Area In Claiborne Parish Gets Discovery

Claiborne Parish's Holsey area has a gas-condensate strike indicated at Stanolind Oil & Gas Co. 1 Mary Ann Washington in 28-22n-5w, ¾-mile north of the townsite.

Recovery on a drill-stem test at 10,119-160 ft. in the Haynesville formation was a 3,160-



ft. water cushion and 480 ft. of oil in 1 hour. A core from 10,163-210 ft. recovered 16½ ft. of what is believed to be effective pay sand. Recovery by reverse circulation was estimated at 20 bbl. of 52.6°-gravity oil. A lime zone, possibly Smackover, was tested at



A CLEAN START FOR OTHER PRODUCTION AIDS

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DOUBLE ACTION MCA

Fracturing, squeezing, flooding and other production improvement jobs get off to a clean start if the well is first cleared of mud and foreign matter with double action MCA. Halliburton's exclusive Mud Cleanout Agent breaks down water-oil emulsions and water-mud blocks to open the way for effective use of production boosters.

An application of MCA preceding formation fracturing has given lower fracturing pressures and greater, longer-lasting oil production. Water injection and disposal wells have also benefited from MCA treatments as injection rates are increased and injection pressures reduced.

MCA's double action, double ingredients make it possible to give this economical, helping hand to production increasing treatments. It's the MCA combination of hydrochloric acid and Morflo, the highly active surfactant, that has the power to break blocks, release water, disperse solids and make it easy to flush away clogging materials.

Another important application for the cleaning action of MCA has been its use ahead of cement on squeeze jobs. A Washington, Oklahoma, well was squeezed seven times with 250 sacks of cement being placed each time with pressures of 6,000 p.s.i. When these treatments still failed to stop water, the eighth job used 500 gallons of MCA ahead of the cement. Pressures dropped when it started to enter the formation, but only 80 sacks of cement were squeezed before pressure reached 7,900 p.s.i. The well was drilled out and produced with no water – just as has been done on hundreds of other "problem" wells.

When low production calls for improvement techniques, that's the time to consider the use of MCA. It can help your well get the full benefit of the production improvement job, and can help you get the full benefit of your well's production. Call your local or district Halliburton office. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

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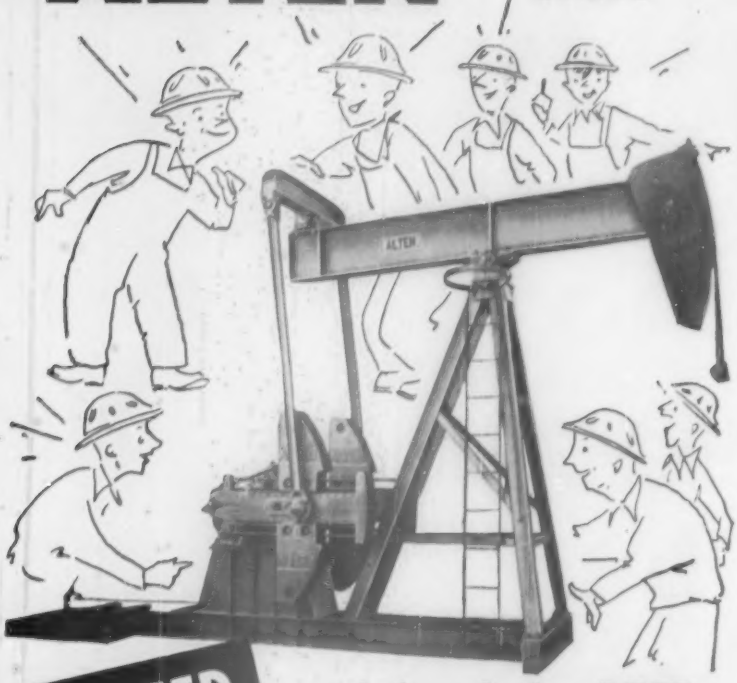

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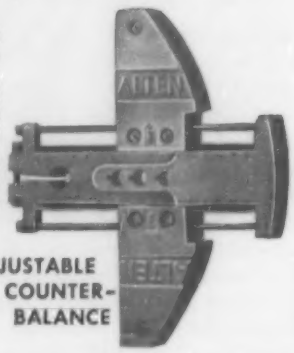
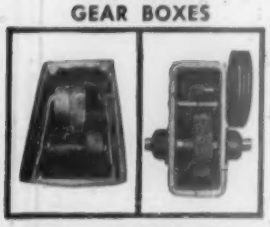


TWO GREAT GEAR BOXES



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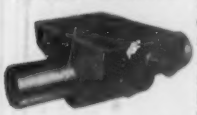

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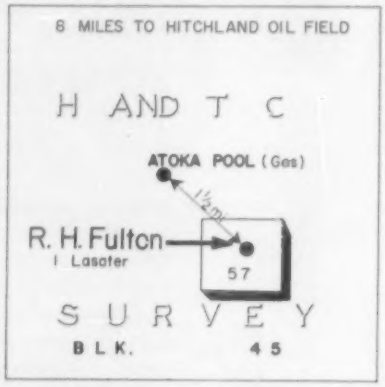
10,300-342 ft. Nearest comparable depth production is Summerfield field.

HUGOTON EMBAYMENT

Prolific Morrow Oil Well Flows In Hansford County

Northeastern Hansford County, Texas Panhandle, has a big new Morrow sand oil discovery 9 miles northeast of Spearman.

R. H. Fulton's Lasater, Section 57, Block 45, H&TC Survey, flowed 27 bbl. of oil hourly, or a calculated 648 bbl. per day with no water from perforations at 7,040-50 ft. Operator is waiting for tank space.



Nearest production to the newest of Pennsylvanian discoveries in the Panhandle area is Colorado Oil & Gas Co. and Fulton 1 Steele, an Atoka gas pool. Hitchland Pennsylvanian oil field lies about 8 miles northwest. This is a Humble field, opened several months ago in Douglas sand (Pennsylvanian) pay.

Morrow Gas Pool Opened In Clark

Clark County in southwestern Kansas has a new Morrow (Pennsylvanian) sand gas field in prospect at Sinclair Oil & Gas Co. 1 Combrink, C NW SE 22-33s-21w.

The wildcat flowed gas in 1 minute at the rate of 7,000 M.c.f. per day on drill-stem test in the Morrow at 5,318-35 ft. The gas volume increased throughout the test. Recovery was 60 ft. of heavily distillate-cut mud.

The 1 Combrink is on a 1,520-acre block of Sinclair. It is 2 miles north of Harper Ranch pool, another Morrow area. The new strike is 3½ miles southeast of the town of Sitka, Kans.

Rank Oil Discovery Reports Final Gage In Texas County

Oceanic Oil Co.'s Des Moines (Pennsylvanian) discovery in Hugoton field, Texas County, Oklahoma Panhandle, pumped 20 bbl. of oil and 133 bbl. of water per day from perforations at 5,360-68 ft. on final gage.

The discovery is deep inside Hugoton gas field and is more than 30 miles from nearest deep produciton.

Northwest Eva field . . . United Carbon Co., Inc. 1 Burns, SW SE 10-4n-10eCM, 1 mile southwest of Northwest Eva field in Western Texas County, reported 5,210 M.c.f. of gas per day on a 45-minute drill-stem test in the Kelly sand (Pennsylvanian).

Perforations were at 4,420-50 ft. The wildcat is an assured gas extension.

Beaver County . . . A central Beaver County, Oklahoma wildcat, American Gas Producing Co. 1 Shadden, SE SE 26-3n-24eCM, reported on latest flow gage of the Douglas sand 2,500 M.c.f. of gas per day and some oil.

The wildcat, 11 miles southeast of Beaver, previously flowed 6,000 M.c.f. of gas per day after acidization and fracturing. Perforations were at 5,476-94 ft. Earlier, the wildcat confirmed the Southwest Camp Creek field pay zone at 7,280-99 ft.

J. M. Huber 1 Davis, NE SW 30-6n-22eCM, has potentialed for 47,994 M.c.f. of gas per day, calculated plus 35 bbl. of distillate in 6 hours through 1-in. choke. Perforations were in the Morrow at 6,117-29 ft. The wildcat, a 2½-mile north extension to Mississippian production at Greenough field, also flowed 4,834 M.c.f. of gas per day plus 25 bbl. of distillate from the Chester (Mississippian) at 6,291-6,301 ft. The Morrow discovery gives the field two pays from two different ages, Mississippian and Pennsylvanian.

APPALACHIAN AREA

PENNSYLVANIA

New Maps

The Pennsylvania Geological Survey of the Commonwealth of Pennsylvania has published three sets of structure maps of the plateau region of north-central and western Pennsylvania.

The first consists of a surface structure-contour map with a contour interval of 100 ft. drawn to a scale of 1:250,000 or about 1 in. to 4 miles. On a second map, using the same scale and contour interval, the structural data have been projected onto the top of the Oriskany (Lower Devonian). More than 1,000 wells drilled to the Oriskany or deeper served as primary control points. The names that have been given to the various structural features are shown on a third map drawn to a scale of 1:500,000.

Copies of the maps may be obtained from the Division of Documents, Department of Property and Supplies, Harrisburg, Pa.

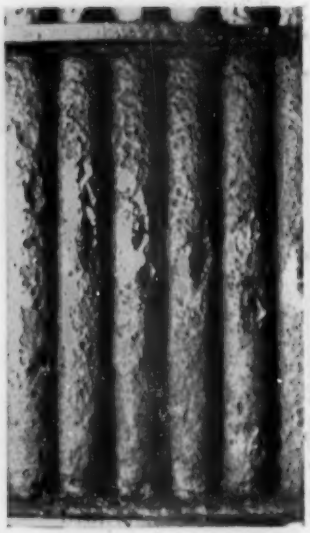
Parker Township, Butler County, Southwest Pennsylvania, Walker et al 1 John Walker, is drilling at 6,475 ft. Salt Lick Township, Fayette County, Mid Atlantic Oil & Gas Co. 1 Adolph Dupre, recorded the chert at 8,191-8,355 ft., with drilling at 8,390 ft. Grant Township, Indiana County, Fairman Drilling Co. 1 Herb Gernandt, is setting the casing at 7,095 ft. In Banks Township, Keta Oil & Gas Co. 1802 Farmers and Miners Trust Co., is at 1,355 ft.

WEST VIRGINIA

In Allen district, Morgan County, West Virginia, operations have been announced by John Fox et al, at 1 Amasa Nestor rank wildcat, which is now the easternmost well to be drilled in this state. It is on the Hancock Quadrangle, 4.52 miles south of latitude 39 degrees 40 minutes and 1.25 miles west of longitude 78 degrees 10 minutes. It is on the waters of Yellow Springs Run and approximately 2¼ miles southeast of Berkley Springs.

OHIO

A mile step-out to the new pool in eastern Madison Township, Licking County, resulted in a small Clinton gasser. Hill and Son 1 (3) O. E. Wise, Lot 12, found the sand at



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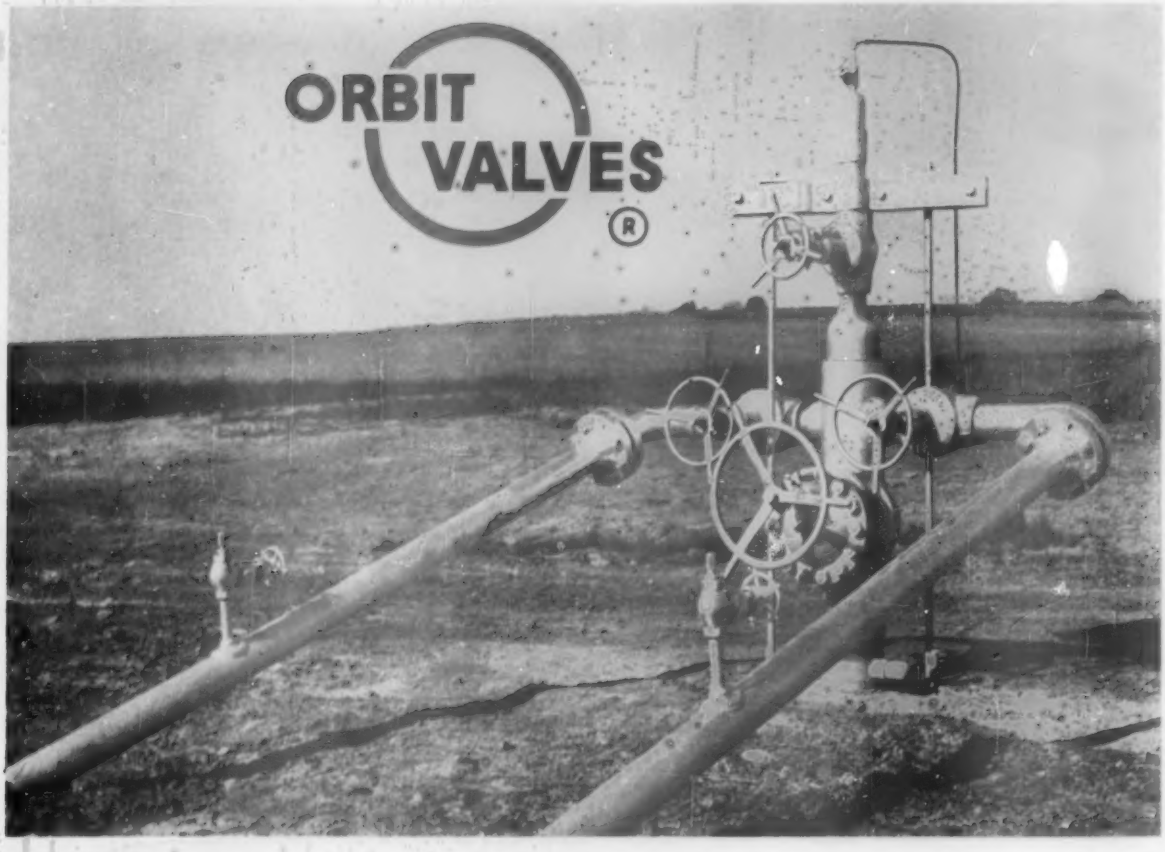

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2,665-2,692 ft. with 225,000 cu. ft. natural.

National Gas 3 Forrest Cooperrider, Section 18, Hopewell Township, Perry County, extended the Glenford pool ¼ mile to the north. Clinton at 2,751-2,782 ft. made 5 bbl. natural and 185 bbl. in 24 hours after fracturing.

Pure Oil 1 Levi Beal, Section 13, New Castle Township, Coshocton County, after producing natural for some time, was fractured and made 340 bbl. with 375,000 cu. ft. gas in a 24-hour test.

CANADA

Five Prospects Reported In Two Western Provinces

Five wildcats in western Canada brought encouraging news this week, including one Saskatchewan exploratory driller that found oil, and four Alberta wildcats that gave up oil or gas, with one already being classed as noncommercial.

The Saskatchewan find this week was made by Shell Oil Co. near Holloway, in the southeastern sector of the province, about 20 miles southeast of Weyburn. This venture gave up free oil during drill-stem test in the Charles member of the Mississippian, and yielded some encouragement in the Mission Canyon.

The well, Shell A-10-20 Holloway, LSD 10, 20-6-11w2, is 3½ miles west of the Midale Mississippian oil field. Charles test from 4,558-90 ft., flowed gas in 58 minutes and recovery was 60 ft. of gas-cut oil, 150 ft. of oil and gas-cut mud and 60 ft. of mud. The Mission Canyon encouragement came during test from 4,647-63 ft., with 1 hour recovery of 150 ft. of oil and gas-cut mud. Well is bottomed at 4,908 ft., and crew is logging.

Alberta . . . The week's most recent oil strike in Alberta came at the Rio-Prado Consolidated Oil Ltd.'s exploratory venture in the Chauvin area, about 1 mile west of the Saskatchewan border in the central sector of the province. The well, Rio-Prado 16C-11 Chauvin, LSD 16, 11-43-1w4, is 1¾ miles southeast of Chauvin oil wells, separated from that field by dry hole, and 35 miles east-southeast of Wainwright. The well encountered 22°-gravity oil during 1 hour drill-stem test in the Spark sand (Lower Cretaceous) interval 2,020-38 ft. Pipe recovery was 100 ft. of clean oil and 90 ft. of heavily oil-cut mud. Coring down to 2,056 ft. showed further oil-staining, and well was deepening preliminary to setting production casing at week's end.

Gem . . . In southern Alberta, a wildcat being drilled by Canadian Export Gas, Ltd., in the Gem district, was chalked up as an indicated quadruple zone discovery well. This venture, that had 2 weeks previous, recorded gas discovery in the Bow Island, this week encountered gas in a second horizon and found oil in two other formations.

The well, Canadian Export-Ohio 6-7 Gem, LSD 6, 7-23-17w4, is on a 60,000-acre farmout spread from Ohio Oil Co. and Midcon Oil & Gas, Ltd., and a group of associates. It is 70 miles due east of Calgary and 10½ miles west-northwest of Delhi-Socony 1 Gem, the nearest previous driller.

The new gas find was made in the Blairmore during test 3,885-3,835 ft., with maximum flow rate being 1,450,000 cu. ft. daily. Initial oil came from the Sunburst during test in the detrital interval 4,058-75 ft. Ninety-two minute recovery was 80 ft. of frothy oil-cut mud and 680 ft. of clean 30.6°-gravity oil. The second oil discovery was indicated during test in the Madison limestone from 4,073-4,095 ft., with valve open 1 hour. Recovery was 120 ft. of oil (comparable to the Sunburst in gravity), and 100 ft. of muddy oil. Well is now deepening, with current depth below 4,300 ft. The well's initial discovery was made in the Bow Island sand, when drill-stem test from 3,266-86 ft. flowed gas in 2 minutes at maximum rate 1,000,000 cu. ft. daily.

Carbon . . . In the Carbon area, 40 miles northeast of Calgary, a team of Anglo-Canadian Oil Co., Ltd., Union Oil Co. of California, and Kroy Oils, Ltd., found a showing of oil in the D3 Devonian coral reef at a wildcat, Anglo-Union-Kroy 24-7 Carbon, LSD 7, 24-29-24w4, but the well has been abandoned as noncommercial. Drill-stem test from 6,478-90 ft. flowed gas at maximum rate 250,000 cu. ft. daily decreasing to 150,000 cu. ft. daily, with a slight oil spray in 28 minutes. Pipe recovery was 85 ft. of oil, 150 ft. of very gassy oil-cut and slightly salty mud and 160 ft. of oily gassy salt water. A later test confirmed only a thin section above water, as all recovery was formation water.

12-Mile Creek . . . The other well to chalk up discovery this week was a gas discovery in the 12-Mile Creek area of southeast Alberta, 25 miles southeast of Brooks. The venture is Baysel-Charter 11-32 Twelve Mile Creek, LSD 11, 32-15-12w4.

About 15 ft. of gas sand was encountered, and drill-stem test in the Bow Island interval 2,320-30 ft. flowed gas at rate of 4,800,000 cu. ft. daily. String of production casing has been set and rig has shifted for another wildcat in the region.

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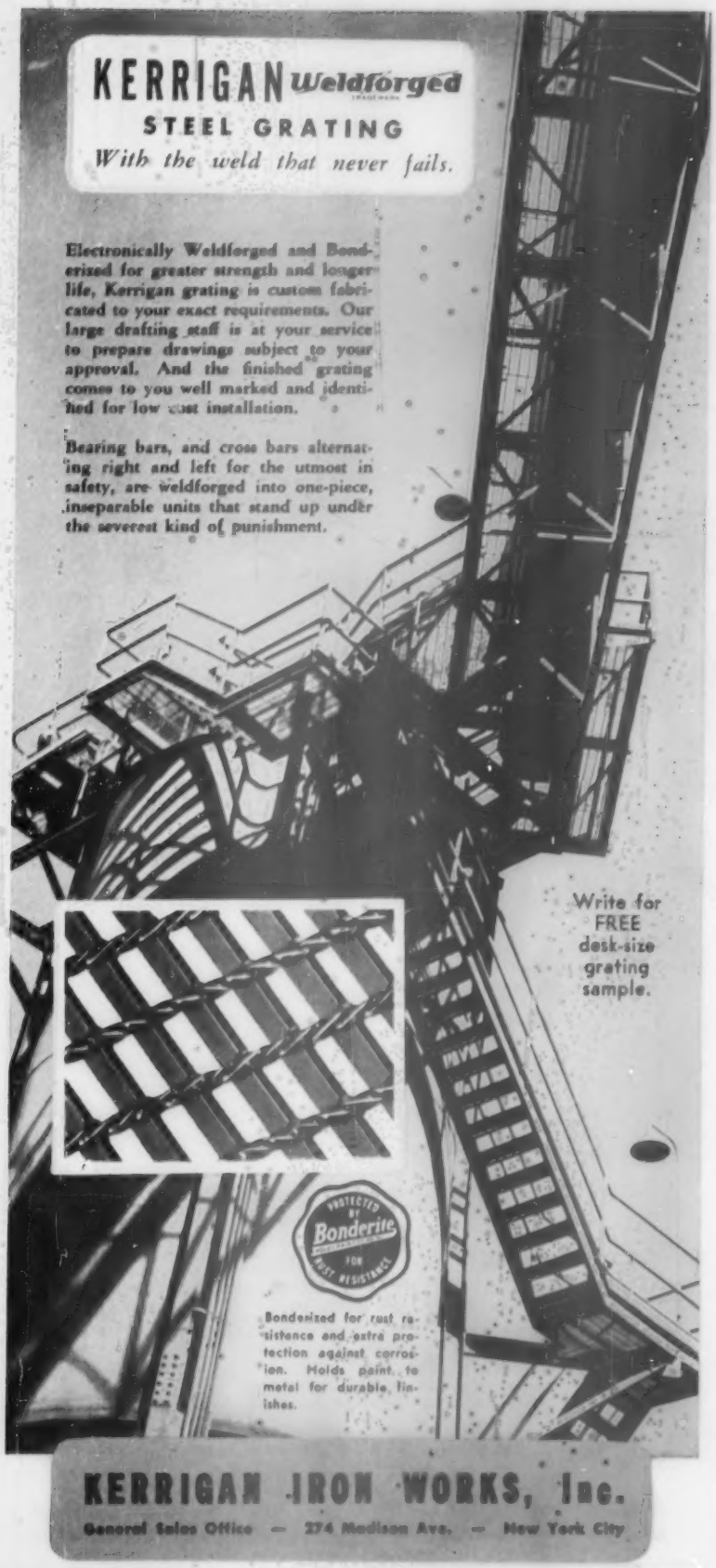
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KANSAS

Lansing Sprays Oil In Pratt County Prospect

Anschutz Drilling Co. has an indicated Lansing lime discovery in Pratt County, 3 miles southwest of Gereke pool.

The 1 Tatlock, NE NE NW 28-26s-15w, 3 miles southeast of Hopewell, recovered 570 ft. of free oil on a drill-stem test at 3,906-42 ft.

Mississippi Pool Seen for Wichita Area In Sedgwick

The area just south of Wichita in Sedgwick County has a new Mississippian oil pool in prospect.

Beardmore Drilling Co. 1 Tyson, NE SE SW 30-28s-1e, recovered 780 ft. of free oil and 180 ft. of oil and gas-cut mud on drill-stem test at 3,154-85 ft. The indicated pool discovery is 1½ miles southwest of Robbins pool in the southeastern part of the county. A test at 3,176-85 ft. recovered 250 ft. of free oil and 20 ft. very heavily oil and gas-cut mud in 1 hour.

Barber Gas Prospects

A new gas pool is indicated for Barber County 8 miles northeast of Medicine Lodge at Joe Aylward and Orville Parker 1 Maes, NE NE SW 27-30s-11w.

The Douglas strike gaged 7,600 M.c.f. of gas on test at 3,759-69 ft.

Testing continues at another gas pool opener 1½ miles east of Whelan pool in SE SE SE 21-31s-11w. Orville Parker 1 Chain gaged 2,300 M.c.f. of gas per day from Douglas perforations at 3,749-53 ft.

Aurora Gasoline Co. and Barbour Drilling Co. gaged 7,000 M.c.f. of gas per day at 1 Rathgerber, C NE SE 31-34s-12w, 7½ miles south of Boggs pool in south-central Barber County. The flow was from the Mississippian.

New Zone for Marion Area Opened At Wildcat

The Simpson is a new pay zone for the Durham pool area of Marion County. Anderson-Prichard found a good oil show at 1 Hett, SW NE SW 3-19s-2e, 1½ miles south of Durham pool.

Recovery was 60 ft. of oil and 110 ft. oil-cut water on first test at 3,041-52 ft. The last test, 3,040-46 ft., got 100 ft. of oil and 30 ft. oil-cut water. Gas was gaged at 1,000 M.c.f. on a Mississippian test at 2,521-93 ft.

Pawnee Activity

Honaker Drilling Co. and Derby Oil Co. are putting in tanks at 1 Boyd, southern Pawnee County gas and oil discovery. The conglomerate strike flowed an estimated 5,000 to 10,000 M.c.f. of gas per day plus 18 bbl. of oil in 3 hours after fracture treatment. The wildcat is located in SW SW SW 35-22s-17w, 1 mile east of Garfield pool.

New Discoveries

Both Rooks and Graham counties have new oil pools. Wentworth Drilling Co. 1 Walts, SW SW SW 10-8s-25w, is pumping 175 bbl. of oil per day from the Lansing to open Northeast Schmeid pool in Graham County.

Harold Patton and Murfin Drilling Co. 1

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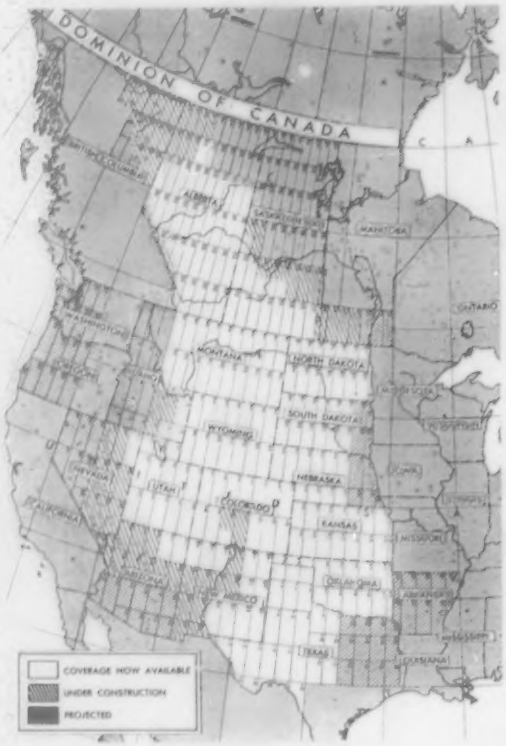

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Fike, NW NW SE 5-9s-17w, Rocks County, opens a new oil pool. The wildcat has a pump potential of 203 bbl. per day from the Lansing lime.

MICHIGAN

The Edward Torosian 2 Nerreter, NE SE NE 2-1s-7e, Salem Township, Washtenaw County, on the northwest side of Northville Trenton oil pool, was reported to have flowed as much as 75 to 100 bbl. of oil an hour natural after being deepened in the Trenton 6 ft. to 4,472 ft., new total depth.

But after tubing was run, well flowed only a total of 138 bbl. of oil on a 6-hour test. Trenton top was logged at 4,220 ft. and well was originally bottomed out at 4,465 ft. when circulation was lost in highly porous, vugular porosity while coring was in progress. The 2 Nerreter is being produced from the upper Trenton pay, more comparable to the oil pay found in the 1 LeMaster discovery than with the second, or so-called Nerreter pay logged in the first well on this same lease.

Taggart Co. 1 Ea/, NE SW NE 2-1s-7e, to the west of the Nerreter lease, was shut down after it appeared that an attempted acid treatment had damaged 5-in. casing seat. Well logged Trenton at 4,091 ft. and hole was bottomed out at 4,537 ft., steel line corrected depth from 4,542 ft., cable measured depth. Possible pay, 4,498-4,510 ft., was perforated with 60 shots. After the attempted acid, which probably channeled the cement around casing, well sprayed oil, gas and water. Gas showed for from 2,000,000 to 3,000,000 cu. ft. a day. This is about the same level at which oil pay was encountered in the 2 Nerreter, and appears to carry mostly all gas.

Woodson Oil Co. 1 Daughter of St. Mary of Providence, SE SW NE 17-1n-8e, Northville Township, Wayne County, a semi-outpost southeast of Northville pool, was being drilled in the Trenton below 4,140 ft. after a drill-stem test was run for 2 hours from 3,990-4,140 ft. Well showed gas to the surface in 5 minutes. Gas was estimated at 70-80,000 cu. ft. Top of Trenton was logged at 3,989 ft. Drilling and coring was still in dolomite at last report.

OKLAHOMA

Chickasha Oil Play Is Taking Leaps and Bounds

Old Chickasha gas field's oil play continues its fast pace in Grady County. General Drilling Co. 1 Farwell "C," SW SE SE 26-5n-8w, recovered 4,700 ft. of free oil on a drill-stem test at 3,141-51 ft. in the Noble Olson (Permian). Another drill-stem test got oil and operator is preparing for still another test at 3,226-50 ft.

Southeast Bradley Report

Grady County's Southeast Bradley area continues to hold high Oklahoma interest. Phillips Petroleum Co. 1 Gilla, SW SE 14-4n-5w, is testing after swabbing recovered 46 bbl. of load in 3½ hours and the well flowed 39 bbl. of load in 1½ hours to pits. Then the well flowed 34 bbl. of load oil in 1 hour to the tanks on 1-in. choke. It then got 127 bbl. of flowing oil, including 61 of new oil in 19 hours on 16/64-in. choke. Operator fractured perforations at 8,880-98 ft.

Magnolia Petroleum Co. 1 C&M Burkes,

C NE SW 12-4n-5w, flowed 130 bbl. of new oil in 6 hours through 24/64-in. choke. Perforations were at 9,250-9,368 ft.

ROCKY MOUNTAIN

MONTANA

Clark's Fork New Pay Discovery Completed

J. Ray McDermott & Co. has completed 1 Unit, SE SW NW 27-9s-22e, Carbon County for a flow of 248 bbl. of oil per day. Production is from basal Frontier through perforations at 6,716-31 and 6,736-49 ft. Test was through 11/64-in. choke.

The well was drilled to a total depth of 8,029 ft. in Morrison, with no shows reported below the producing zone in lower Frontier. The well is the third drilled in this area. British-American Oil Producing Co. drilled a Dakota discovery on the unit, and General Petroleum Co. completed a second Frontier discovery in 1945 which was later abandoned.

The unit was farmed out to McDermott by British-American. Location for a confirmation well has been made at 1 Government-McClellan, C NE NW 27-9s-22e, ¼ mile northeast of the discovery.

Cedar Creek Anticline Wildcat Gaged

Shell Oil Co. has completed an Ordovician discovery about 2 miles north of Little Beaver in Fallon County. The well, 14-34 Unit, C SW SW 34-5n-61e, pumped 209 bbl. of oil and 1 bbl. of water per day from Red River (Ordovician) at 8,202-8,319 ft. Shell has not yet announced location for further wells in the area.

Apparent West Poplar Area Discovery Testing

Phillips Petroleum Co. and Carter Oil Co. recovered 29 bbl. of oil and 9 bbl. of water in 8 hours of swabbing at 1 Tribal, C SW SW 2-29n-50e, in the West Poplar area, Roosevelt County. Test was of perforations in Madison at 6,450-68 ft. The well is the fourth drilled by these operators on the unit, and the first to indicate successful completion.

NORTH DAKOTA

Bottineau County Wildcat Tested

Cardinal Drilling Co. has reported a flow of 33 bbl. of oil per day at 1 Steen, SE NE 31-164n-78w, in the North Westhope area of Bottineau County. Test followed acidization 3,052-56 ft. Top of Mission Canyon was found at 3,031 ft. The well pumped 61 bbl. per day before acid treatment. Cardinal is continuing tests.

WYOMING

Neiber Dome Discovery Completed

The California Co. has completed 8 Neiber Dome Unit, NW NW NE 30-45n-91w, Washakie County for 258 bbl. of oil per day. Production is from Tensleep in open hole at 10,489-10,546 ft. The well is about 5½ miles south of previous production on the unit, and is the first Tensleep producer on

A New Angle..

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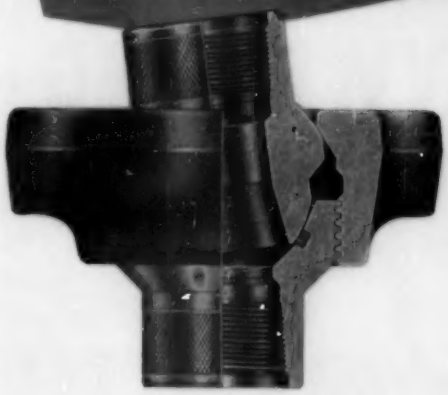
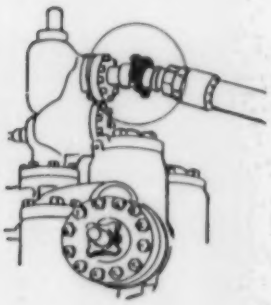


FIG. 603
6000 p.s.i.



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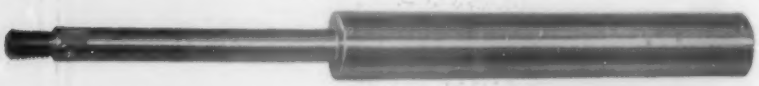
The COLMONOY Spraywelder applies COLMONOY alloys to the wear areas of any metal part. The sprayed overlay is then welded to the base metal by fusing it with an oxy-acetylene torch. The even application makes the removal of more than .010″ per side in finishing very rare.

A COLMONOY Sprayweld surface is non-porous, non-sparking, and has a low coefficient of friction. It resists corrosion, abrasion, and oxidation.



This acid sludge pump plunger was being repacked every 8 hours, and replaced every 24. At half the cost of new plungers, Spraywelding with COLMONOY No. 6 *stretched repacking intervals to 60 hours, and increased total life to 573 hours.*

Write today for the new catalog describing the Model C Spraywelder.

HARD-FACING ALLOYS

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the structure. Previous production has been from Phosphoria.

The discovery also made oil from Phosphoria, and the operator had reported intention to complete dually. For an indefinite period production will be only from Tensleep.

Shows Unofficially Reported At Park County Wildcat

Unofficial reports have credited Trigood Oil Co. with recovery of free oil on drill-stem test of Phosphoria at 1 Unit, C SE NW 28-49n-99w, in the Meeteetse area of Park County. The operator has neither confirmed nor denied reports. Reported drilling depth is 11,307 ft. The well is in the same general area where a Wilshire Oil Co. wildcat tested substantial Phosphoria shows in 1951 before suspension.

Confirmation Completed At South Ash Creek

Shell Oil Co. has completed the second well in the South Ash Creek area of Sheridan County for a pump gage of 181 bbl. of oil per day. It is ½-mile south of the recent pool opener which Shell completed for 260 bbl. per day. Production is from Ash Creek sand through perforations at 4,732-50 and 4,754-64 ft. The new pool is 2½ miles south of Ash Creek field, which was rated one of the most important developments in the Powder River basin during 1952.

Savery Confirmation Try Scheduled

Carter Oil Co. has made location for a shallow Mesaverde test in the Savery Unit, Carbon County. The well is 2 Unit, C SE NE 20-13n-89w. Carter completed a Mesaverde gas producer for more than 800,000 cu. ft. per day from 1,300-15 ft. during 1953. This earlier well was drilled to a total depth of 8,055 ft. in basement, and plugged back for completion in the shallow gas zone.

COLORADO

Jackson County Discovery Tested

Lion Oil Co. swabbed at the rate of 32 bbl. of oil per hour on 3-hour test of Lakota at 1 Dwinell, C NE SW 23-10n-79w, Jackson County. Test was of the interval 4,654-64 ft. Following swab test the operator allowed the well to flow, and recovery was at the rate of 7.6 bbl. of oil per hour. The wildcat is now shut in for storage.

This well made commercial recoveries from both Lakota and Dakota. Both zones flowed at approximate rates of 7 bbl. per hour on drill-stem tests. Dakota has not been tested since casing was set.

La Plata County Wildcat Flows Gas

U. S. Smelting, Refining & Mining Co. has reported recovery of gas from lower Dakota at 1 Brown, C SE 15-33n-9w, flow at the rate of 7,500,000 cubic ft. per day was reported on test of the zone 7,902-65 ft. Tool was open for 1½ hours, and gas flowed after 5 minutes, with flow through ¼-in. choke. Flowing pressure was 3,325-3,450 psi. The operator is reported reaming, with total depth 7,955 ft.

The apparent discovery is about 3 miles west of Ignacio gas field, where Dakota-

Morrison production, as well as Fruitland-Pictured Cliffs production has previously been established. There has been very little exploration in the area west of Ignacio and east of Red Mesa, although current activity is the highest in some time in the area.

ARIZONA

Boundary Butte Wildcat Waiting On Orders

Shell Oil Co. has recovered oil and water on swab tests of 2 Boundary Butte, C SE NW 3-41n-28e, Apache County, and is reported waiting on orders. On 10½-hour swab from 4,745-62 ft. recovered was 109 bbl. of fluid, cutting 47 per cent with water and sediment. Test 4,745-73 ft. flowed oil, gas and water and recovery in 10¼ hours was 36 bbl. of fluid, approximately 44 per cent cut. Tests are within the Pennsylvanian zone. The well previously flowed gas at the rate of nearly 3,500 M.c.f. per day on drill-stem test in Pennsylvanian.

CALIFORNIA

Guijarral Tests Fail

Two exploratory tests connected with recent Leda sand discoveries in the Guijarral Hills area of Fresno County were abandoned. Outcome of a third well, a ½-mile northwest outpost, was expected to be determined late last week.

The dry holes were T & T Oil Co. 8-24 Guijarral in SW SW 24-20s-16e, and Standard Oil Co. of California 34 33-F in Section 33. The former, a 10-319-ft. test, was a 1-mile northeast stepout in Union Oil Co.'s recent Leda sand discovery on the north flank of the field. The Standard test, drilled to 8,666 ft., was a south offset to the four-well West Guijarral Hills field. Los Nietos Co., operator, was coring below 9,700 ft. at 38-22 Guijarral Service in SE SW Section 22.

Helm Extension Indicated

Intex Oil Co. apparently had a new pool discovery 1½ miles southeast of Lanare area production in Helm field, Fresno County. Its 26-29 Benadom, in NW SW 29-17s-19e, was pumping about 45 bbl. of oil and 30 bbl. of water daily. The test was drilled to 8,666 ft. after topping the Domingine (Eocene) at 8,460 ft. Production was being obtained from the interval 8,296-8,316 ft.

Tejon Flats Outpost

Reserve Oil & Gas Co. was preparing to start 28-23 Reserve as a wildcat 1¼ miles northeast of its new Olcese (Miocene) pool at Tejon Flats, Kern County. Located in NW SW 23-11n-19w, the test is about ¾ mile north of a ½-mile east outpost being drilled by Union Oil Co. The latter, 16-26 Reserve-Union, was drilling below 5,300 ft. toward the 5,700-ft. oil sand.

LEGAL

SEALED BIDS will be received until 2:00 P.M., Mountain Standard Time, November 3, 1954, and opened at that time in the Office of the Superintendent, Blackfeet Indian Agency, Browning, Montana, for the leasing of 36,484.79 acres of Tribal land and 11,835.41 acres of allotted Indian land, located in Glacier and Pondera Counties, Montana, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Blackfeet Indian Agency at Browning, Montana, or call the Agency Land Office, phone 2561, Browning. Charles S. Spencer, Superintendent.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

District 1

Frio County: P. G. Lake 1 Gracey and Wegehnoff, James Montgomery Sur. 8½, A-824. Dry. TD 3,830 ft.

Guadalupe County: Harry Henderson 1 Schmidt, Mich Miller Sur., A-219. IP 193.8 BOPD, ¼-in., 21°, Buda lime 2,070-2,103 ft. (perforations). TD 2,237 ft. (New field—Kingsbury.)

LaSalle County: Alaska Steamship Co. and Newman Brothers Drilling Co. 17-B South Texas Syndicate, CCSD & RGNG 157, A-779. Dry. TD 6,190 ft.

Lee Brothers Oil Co. 1 Storey, H&GN Sur. 141, A-268. Dry. TD 5,200 ft.

Williamson County: Shell Oil Co. 1 Purcell, William H. McGill Sur. Dry. TD 9,479 ft. in granite. Elev 974 ft., Ellenburger 6,930 ft.

District 4

Duval County: F. William Carr 1 Yates, E. R. Gray Sur. 224, A-1105 (Strake Area). Dry. TD 3,863 ft.

Leavitt Corning, Jr., 3 Duwel, E. G. Garza Sur. 92, A-805. Dry. TD 3,985 ft.

Jim Wells County: Gust Tsesmelis et al 1 Joseph, Lavaca Grant, A-36. Dry. TD 5,580 ft.

Kleberg County: Sun Oil Co. 2-A Dun-McCampbell, Padre Island. Dry. TD 8,727 ft.

Nueces County: Gulf Oil Corp. 1 State 41321, Tract 774, Gulf of Mexico. Temporarily abandoned. TD 12,500 ft.

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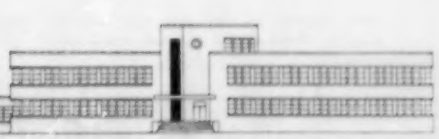

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WILDCAT COMPLETIONS

Vickers Petroleum Co., Inc., 1-B Stone, Section 32, Paul Subd., Driscoll Ranch. Dry. TD 7,615 ft.

Starr County: Nessly & Corrigan 1 Rodriguez, Block 1, Porcion 88. Dry. TD 2,500 ft.

Webb County: Harold K. Boysen 2 Bruni est., Block 31, Brown Subd., Albercas Grant. Dry. TD 3,151 ft.

Magnolia Petroleum Co. 1-A Nancy de Spain, CCSD & RGNG Sur., Section 38, Block 2. Dry. TD 2,205 ft.

TEXAS GULF COAST

District 2

DeWitt County: Geochemical Surveys, Inc., 1 Tam, William L. Lytle Sur., A-303. Dry. TD 9,012 ft.

Victoria County: Harrell & Southworth 1 Lander, SA & MG 6, A-371. Dry. TD 6,488 ft.

District 3

Brazoria County: San Jacinto Petroleum Corp. 1 Corbett et al, W.D.C. Hall Sur., A-69. IP 102.13 BOPD, 10/64-in., 37°, Frio 7,607-09 ft. (perforations). TD 8,007 ft. (New pay in, and extends Bonney field.)

Union Oil Co. of California 1 Continental, Lot 25, Brown Brothers Subd. (West Columbia townsite), J. H. Bell Sur., A-40. Dry. TD 6,545 ft.

Chambers County: Michel T. Halbouty and Hurt Oil Co., Ltd., 1 Kirby, Chambers County School Land Sur., A-321. Dry. TD 8,512 ft.

Sparta Oil Co. 1 State of Texas, Tract 6-7c, Galveston-Trinity Bay. Dry. TD 8,910 ft.

Fort Bend County: S. J. Barnett 1 Crutcher et al, A. Roberts Sur., A-78. Dry. TD 4,216 ft.

Gulf Coast Leaseholds, Inc., 1 Chaloupka, BBB&C Sur. 7, A-130 (northwest flank Big Creek dome). Dry. TD 7,260 ft.

Lamar Hunt Trust Est. 1 Hale et al, Barrett & Harris Sur., A-8. Dry. TD 8,451 ft.

Grimes County: Woodley Petroleum Co. and Signal Oil & Gas Co. 1 Wilson, Cyprus Campbell Sur., A-11. Dry. TD 4,803 ft.

Hardin County: Cities Service Oil Co. 1 Kirby, William Wingate Sur., A-486. Dry. TD 9,835 ft.

Jefferson County: Clegg & Hunt et al, 1-A Frost, T&NO Sur. 78, A-709. IP 140,000 M.c.f. daily, open-flow potential, gas-condensate ratio 46,104 cu. ft. per barrel, 49.5°, Frio 10,882-973 ft. (perforations). TD 11,257 ft. (New pay in Marrs McLean field).

Matagorda County: Fidelity Oil & Royalty Co. and Houston Natural Gas Production Co. 2 Doman et al, Henry Harrison Sur., A-47. Shut-in gas well. TD 11,025 ft. (New field).

Orange County: American Republics Corp. and Houston Oil Co. 2 Williams, W. C. Woods Sur., A-436 (Doty area). Dry. TD 8,200 ft.

EAST TEXAS

Camp County: F. R. Jackson et al 1 Carpenter, J. B. McMahon Sur. Dry. TD 3,850 ft.

Freestone County: Humble Oil & Refining Co. 1-B Bonner, John Love Sur., A-362. Dry. TD 4,380 ft.

Henderson County: Westbrook Oil Corp. 1 Allen & Kinabrew, John Albright Sur., A-16, 1½ mi. S Malakoff field. IP 322 BOPD, 3/16-in., 45°, TP 1,150 psi., GOR 1,079 cu. ft., Bacon limestone 7,604-12 ft. TD 7,665 ft.

Hunt County: Sam Lett 1 Renshaw, J. A. F. McCasland Sur., A-705. Dry. TD 3,103 ft.

Marion County: O. C. Billingsley 1 Billingsley Jr., S. A. Miller Sur. Dry. TD 3,318 ft.

F. R. Jackson 1 Fant, L. P. Cadenhead Sur., A-74. IPP 29.6 BOPD, 42°, Mitchell sand 6,147-59 ft. TD 6,239 ft.

Smith County: Continental Oil Co. 1 Mayfield Co., L. B. Jasper Sur., A-515. Dry. TD 8,805 ft.

WEST CENTRAL TEXAS

Callahan County: Intex Oil Co. 1 Jackson, Sec. 5, T&NO Sur. Dry. TD 4,466 ft.

R. D. Jackson & C. B. Frost 1 Bryant, Samuel St. John Sur. 831. Dry. TD 1,885 ft.

Jackson & Frost 1 Mason, Blk. 75, Comal CSL Sur. 181. Dry. TD 1,852 ft.

R. Makin 1 Eddington, Blk. 60, Comal CSL Sur. 181. Dry. TD 1,603 ft.

Haskell County: Drilling & Exploration Co. 2 Cannon, 92-1-H&TC. Dry. TD 2,550 ft.

M. D. St. John and Currie & Wylie 1 Norman, 71-3-Red River CSL. Dry. TD 5,882 ft.

Jones County: Glenn & Lang 1 Phillips, Harrison CSL Sur. 333. Dry. TD 3,225 ft.

West Central Drilling Co. 1 Stephenson, 7-16-T&P Sur. Dry. TD 2,485 ft.

Stephens County: J. E. Connally & Callihan Rotary Co. 1 Coody, 51-5-T&P. Dry. TD 3,391 ft.

Taylor County: Chester Imes 1 Poteet, W. W. Sill Sur. 23. Dry. TD 2,137 ft.

Lamar H. Moore Drilling Co. 1 Tillett,

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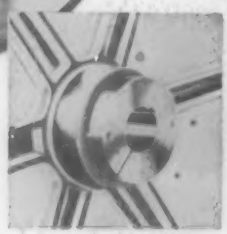

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Blk. 7, Guadalupe CSL Sur. 145. Dry. TD 3,827 ft.

NORTH TEXAS

Archer County: Glenn W. Cooper 1 Mowl, Blk. 2, Meade Pasture Subd. Dry. TD 1,300 ft.

Double L Drilling Co. 1 Harkey, Blk. 37, G. P. Meade Subd. Dry TD 1,493 ft.

Double L Drilling 1-C Petrex, Sec. 103, Lot 1, ATNCL Subd. Dry. TD 1,564 ft.

Grayson County: Howell, Holloway & Howell 1 Burks, S. Prather Sur., A-932. Dry. TD 3,900 ft.

Jack County: Anderson Production Co. 1 Gregory, Nancy Overby Sur., A-452. Dry. TD 3,542 ft.

Curran-Kiel Drilling Co. 2 Keller, G. H. Mabler Sur., A-1142. IP 42 BOPD, 8/64-in., 40°, pay 2,180 ft. TD 2,183 ft.

Jack Grace Production Co. 1 Morgan, L. A. Samples Sur., A-2172. Dry. TD 5,822 ft.

Walter L. Plemons Production Co. 2-A Stoddard, W. Matlock Sur., A-1479. Dry. TD 3,011 ft.

Montague County: Star Oil Co. 1 Johnson, J. W. Wilson Sur., A-1130, 5 mi. NE Bowie. IP 349 BOPD, 20/64-in., 42°, TP 400 psi., GOR 875 cu. ft., conglomerate 6,407-15 ft. TD 6,908 ft.

Wilbarger County: Ben F. Lowell 1-M Waggoner, 18-4-H&TC. Dry. TD 2,501 ft.

P-M Drilling Co. 1-A Waggoner, 41-A493-MEP&P. Dry. TD 2,504 ft.

Frank Wood 1 W. T. Waggoner "John," Sec. 2, SPRR Sur. Dry. TD 2,506 ft.

Young County: Cascade Petroleum Co. 1 Vance, TE&L Sur. 2730. Dry. TD 4,356 ft.

O. P. Leonard 3 Haggard, TE&L Sur. 744, A-749. Dry. TD 3,038 ft.

Joseph C. Ross 2 Hughes, TE&L Sur. 1015, A-824. Dry. TD 2,170 ft.

WEST TEXAS

Andrews County: J. C. Barnes 1-Q University, 15-4-University Lands Sur. Dry. TD 12,730 ft. Elev. 3,192 ft., Devonian 12,-665 ft.

Shell Oil Co. 3-C University, 21-1-University Lands, 8 mi. SE Andrews. IP 248 BOPD, 16/64-in., TP 725 psi., GOR 1,334 cu. ft., Pennsylvanian perforations 9,013-9,102 ft. New pay in S. Andrews field.

Borden County: Oceanic Oil Co. 1 McAdams, 26-32-T3N-T&P. Dry. TD 7,-935 ft. Elev. 2,592 ft., reef 7,897 ft.

J. D. Wrather Jr. 1 Good, 15-32-T3N-T&P. Dry. TD 8,101 ft. Elev. 2,489 ft., reef 8,081 ft.

Crockett County: Jack Cooper 1 Luckett, 9-CD-E. C. Woodruff Sur. Dry. TD 1,550 ft.

E. G. Rodman 1 University, 7-31-University Lands. Dry. TD 1,330 ft.

Garza County: R. S. Anderson and Clifton Thomas 1 Alldredge, 57-6-H&GN. Dry. TD 2,642 ft.

Atlantic Refining Co. 1 Swenson, 60-8-H&GN. Dry. TD 9,518 ft. Elev. 2,200 ft., Strawn 8,830 ft., Ellenburger 8,980 ft.

R. B. Harrid 1 Williams estate, 66-5-H&GN. Dry. TD 2,703 ft.

Sharples Oil Corp. & Joseph I. O'Neill 1 Meeks, Sec. 1240, D&W Sur. Dry. TD 4,360 ft.

Howard County: Woodson Producing Co. 1-A Creighton, 28-33-T1N-T&P. Dry. TD 3,036 ft.

Irion County: Standard Oil Co. of Texas 1-6 Bryant, 24-3-H&TC. Dry. TD 7,164 ft. Elev. 2,181 ft., reef 6,507 ft., Ellenburger 7,103 ft.

Kent County: Addison Warner 1 Sprabling, 16-L-H&TC. Dry. TD 6,999 ft. Elev. 2,163 ft., Mississippian 6,982 ft.

Sunray Oil Corp. 1 Cave, 58-1-H&GN. Dry. TD 7,300 ft. Elev. 2,150 ft., Mississippian 7,154 ft.

Loving County: Ray Morris Drilling Co. 1 Lineberry, 10-75-PSL. Dry. TD 5,344 ft. Elev. 3,149 ft., Delaware sand 5,249 ft.

Mitchell County: Maner Graham 1 Mellie Van Horn, 35-28-T1N-T&P. Dry. TD 3,158 ft.

Reeves County: Luse & Ice 1 Reagan, 42-56-T2-T&P. Dry. TD 3,255 ft.

Trico Exploration Co. 1 Northrup, 34-56-T2-T&P. Dry. TD 3,430 ft.

Schleicher County: Dalton H. Cobb 1 Brown, 71-1-GH&SA. Dry. TD 6,320 ft. Elev. 2,417 ft., Ellenburger 6,115 ft.

Sutton County: M. D. Bryant 1-A Aldwell Bros., 17-EFD-D. Y. Jackson Sur. Dry. TD 500 ft.

Ray Morris Drilling Co. 2 Thomson, 34-A-HE&WT, 6 mi. NE Sonora. IP 1,600 M.f.g., 36-in., pay 5,268 ft. TD 5,472 ft.

Tom Green County: Eason Oil Co. 1 Hobbs, 63-25-H&TC. Dry. TD 4,706 ft.

Plymouth Oil Co. 1 Johnson, Johann Henrich Sur. 537. Dry. TD 6,348 ft. Elev. 1,989 ft., Ellenburger 5,932 ft., Cambrian 6,338 ft.

C. T. Robertson 1 Bennett, Meritz Lachman Sur. Dry. TD 6,680 ft. Elev. 1,969 ft., Ellenburger 6,638 ft.

Ward County: Magnolia Petroleum Co. 1-B University, 34-17-University Lands, 7 mi. NW Pyote. IP 5,984 M.f.g., 25/64-in.,

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Yoakum County: Magnolia Petroleum Co. 1 Frost, 71-D-J. H. Gibson Sur. Dry. TD 5,181 ft.

Great Western Production Co. 1 Nelson, 422-D-J. H. Gibson Sur. Dry. TD 11,587 ft., elev. 3,717 ft., Fusselman 10,850 ft., Devonian 11,550 ft.

WEST TEXAS BORDER COUNTIES

Coke County: A. G. Hill 1 Copeland, 286-1A-H&TC. Dry. TD 6,910 ft.

J. D. Wrather 1 McCutchins, Sec. 327, T. J. Moore Sur. Dry. TD 5,845 ft. Elev. 1,798 ft., Ellenburger 5,417 ft., Cambrian 5,823 ft.

Fisher County: Lester & Duffield 1 Rimmer, 182-1-BBB&C. Dry. TD 6,792 ft. Elev. 1,741 ft. ground, Ellenburger 6,354 ft., Hickory 6,668 ft.

Nolan County: Roark-Hooker-Roark 1 Causseaux, 31-19-T&P, 3 mi. NW Trent. IP 258 BOPD, 16/64-in., 48°, TP 340 psi., GOR 866 cu. ft., Caddo 5,506-31 ft. TD 5,700 ft.

Union Oil Co. of California 1 Earl Hanks, 80-22-T&P. Dry. TD 6,505 ft.

Runnels County: S. C. Herring Drilling Co. 1 Williams, Wharton CSL Sur. 516. Dry. TD 4,100 ft.

Miami Operating Co. 3-A Lindemann, Sec. 262, Austin & Williams Sur., 7 mi. SW Crews. IP 2,500 M.f.g., Jennings sand 3,653 ft., SIP 780 psi. TD 3,816 ft.

C. T. Robertson 1 Bryan, Blk. 6, T. M. Fowler Sur. 440. Dry. TD 4,444 ft.

Harry Todd 1 Deschamp, J. C. McLean Sur. 534. Dry. TD 4,286 ft.

Stonewall County: Bluebonnett Oil & Gas Co. 1 Antilley, 3-9-AB&M, 2 mi. W Old Glory. IP 210 BOPD, 16/64-in., 40°, TP 500 psi., pay 6,032-52 ft. TD 6,137 ft.

Scott L. Talliaferro 1 Duedensing, Sec. 31, BBB&C Sur. Dry. TD 6,081 ft. Elev. 1,664 ft., Mississippian 6,075 ft.

NORTHERN NEW MEXICO

Colfax County: Continental Oil Co. 3 St. Louis, Rocky Mountain & Pacific RR Co., SW NE NW 18-30n-32e. Dry. TD 5,500 ft. Glorieta.

San Juan County: Skelly Oil Co. 1 Navajo B, SW NE SE 14-26n-12w. IP 3,500 M.c.f. of gas per day, Hospah gas discovery, new field. TD 7,134 ft. Entrada.

San Miguel County, East Las Vegas: Continental 1 Leatherwood-Reed, SE SW NE 15-16n-17e. Dry. TD 3,911 ft. Pre-Cambrian.

INDIANA

Dubois County: Ted Uland 1 Jasper Venner Mills, SW NW SW 16-1s-5w. Dry. TD 823 ft.

Posey County: S. G. Walker 1 Spencer, NE SW NE 13-4s-13w. Dry. TD 2,903 ft.

Spencer County: Wimmar Oil Co. 1 McIntyre, SW NE SE 22-7s-7w. Dry. TD 1,817 ft.

Sullivan County: Granholm and Associates 1 Ryan Survey 30-6n-9w. Dry. TD 1,397 ft.

F. L. Beasley 1 J. R. Carter estate, NW NW NW 14-9n-9w. Dry. TD 2,257 ft.

Vanderburgh County: C. C. Beebe 1 Joeckel, 18-7s-11w. Dry. TD 1,808 ft.

Warrick County: G. R. Marshall 1 Beatty-Roesner-Kohle, location unknown. Dry. TD 1,251 ft.

MICHIGAN

Mason County: Ace Oil Co. 1 Marek, et al, SE SE NW 8-18n-17w. Dry. TD 2,283 ft. in Dundee-Monroe.

Midland County: Clem Glavin 1 Henry, SE SE NW 33-15n-2w. Dry. TD 3,881 ft. in Dundee-Monroe.

Missaukee County: Union Development Co. 1 Merrill-Palmer School, S½ NW SE 35-22n-6w. IPF 40 BOD, Richfield pay 5,145-49 ft. TD 5,254 ft., PBTD 5,175 ft. (New, deeper pay in Prosper pool area.)

Oceana County: I. W. Hartman 1 Curtis, SW NW NE 1-14n-19w. Dry. TD 1,774 ft. in Traverse lime.

Roscommon County: L. C. MacGregor & Merrill Drilling Co. 1 Johnson Land & Timber Corp., S½ SW NE 16-22n-3w. Dry. TD 4,973 ft. in Richfield.

Van Buren County: C. W. Collin 1 Belleware-McNellis, SW SE SW 36-2s-14w. Dry. TD 1,152 ft. in Traverse lime.

MISSISSIPPI

Adams County: D. A. Biglane and Sunnyland Contracting Co. 1-B Dille, 16-8n-3w. Dry. TD 6,204 ft. Elev. 273 ft., Wilcox 3,990 ft., base Baker shale 5,786 ft.

Jefferson County: Calto Oil Co. 1 Lisbony, 25-9n-2w. Dry. TD 6,014 ft. Elev. 221 ft., Wilcox 3,752 ft., Pearline 5,500 ft.

J. Paul Ratliff, Jr., 1 Geoghegan, 12-8n-1e. Dry. TD 6,208 ft. Elev. 280 ft., Wilcox 3,867 ft., base Baker shale 5,740 ft.

Sunflower County: Marshall R. Young et al 1 McLean, SE SE SE 9-20n-3w. Dry. TD 4,509 ft.

Wilkinson County: Serio-Punches Oil Co. 2 Pettis, NW NW 39-4n-3w. Dry. TD

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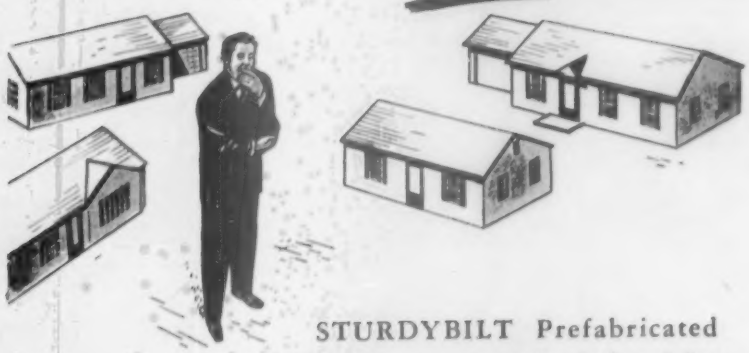

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WILDCAT COMPLETIONS

7,210 ft. Elev. 5[illegible] ft., Wilcox 5,032 ft., base Baker shale 6,894 ft.

SOUTH LOUISIANA

Beauregard Parish: General Crude Oil Co. 1 Ragley, 3-5s-7w. Dry. TD 9,598 ft.

Cameron Parish: Pan American Production Co. J-D Miami Corp., 28-13s-7w. Dry. TD 13,514 ft.

Stanolind Oil & Gas Co. 1 State Lease 1186, Block 39, East Cameron Area, Gulf of Mexico. Dry. TD 11,414 ft.

Stanolind Oil & Gas 2 State Lease 2263, Tract 5261, Calcasieu Lake. Dry. TD 9,037 ft.

Iberville Parish: Natural Gas & Oil Co. 1 Kimball et al, 50-8s-9e. Dry. TD 11,050 ft.

St. Mary Parish: Magnolia Petroleum Co. 1-H State Lease 691, Block 119, Eugene Island Area, Gulf of Mexico. IP 270 BOPD, 11/64-in., 37.3°, perforations 5,-918-30 ft., and 145 BOPD, 12/64-in., 35°, perforations 5,600-20 ft. TD 6,000 ft. (New pays in Eugene Island Block 126 field.)

Vermilion Parish: Pure Oil Co. 2 Vermilion Parish School Board, 16-12s-1w. IP 4,-000 M.c.f. daily (plus distillate spray), 10/64-in., perforations 10,498-516 ft. TD 11,677 ft. (New field.)

NORTH LOUISIANA

Bossier Parish: Murphy Corp. 1 Rodgers, C SE SW SE 28-23n-13w. Dry. TD 3,504 ft.

Caddo Parish: W. C. O'Ferrall & Co. 1 Norton, 17-22n-15w. Dry. TD 2,598 ft.

East Carroll Parish: H. L. Hawkins and F. S. Kelly, Jr. 1 Bowen, 4-22n-13e. Dry. TD 3,127 ft.

Concordia Parish: E. C. Wentworth and Como Drilling Co. C-1 Quinn, 12-4n-6e. Dry. TD 7,210 ft.

DeSoto Parish: Ed E. Hurley-Beene-Day-Buf-kin, 11-12n-13w. Dry. TD 6,606 ft.

McAlester Fuel Co. A-1 Jennie Shelly et al, 21-12n-14w. Dry. TD 4,176 ft.

Jack W. Grisby 1 Schuler estate, 10-13n-15w. IPF 32,500 M.c.f. of gas per day, unest. amt. of cond., 54°, Pettit 6,505-13 ft. TD 7,047 ft. Southeast extension to Bethany-Longstreet field.

Franklin Parish: J. A. Harper et al 1 King-Comeaux Unit, 38-14n-6e. Dry. TD 5,313 ft.

LaSalle Parish: Nebo Oil Co., Inc. 12 Nebo Fee, 13-8n-1e. IPF 24 BOPD, Wilcox 3,484-94 ft. TD 4,213 ft., 16/64-in. (Oil discovery.)

Webster Parish: W. C. O'Ferral & Co. 1 Robert Slack, 12-22n-11w. Dry. TD 3,305 ft.

ARKANSAS

Miller County: W&W Drilling Co. and G. B. Christmas 1 Parks, C NE SE 10-16s-26w. Dry. TD 4,510 ft.

Union County: W. H. Sewell 1 Cottrell, C NW SE NE 23-18s-17w. IPF 65 BOPD, Pettit 3,986-92 ft., 42°, ¼-in. TD 4,027 ft. (Southwest Pettit extension to Schuler field.)

OKLAHOMA

Beckham County: Big Chief Drilling Co. 1 Derby, SW SW NE 16-8n-22w. Dry. TD 1,645 ft.

Garvin County: A. E. Cathey et al 1 Daniel, NE SE SW 15-2n-1e. Dry. TD 3,517 ft.

Grady County: Jordan Petroleum Co. et al 1 F. C. Hall Memorial, C SW NE 8-8n-8w. Dry. TD 13,846 ft.

Robert C. Graham-Hal Folmer 1 Foreman,

(Continued on page 198)

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The close fit of the square burner heads reduces surplus secondary air and results in worthwhile savings on fuel cost. Inferno Medium Pressure Gas Burners are designed for use where economy is just as important as hard firing. Produce an intense blue flame. Easily installed.

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- No sensitive toggles to get out of adjustment!
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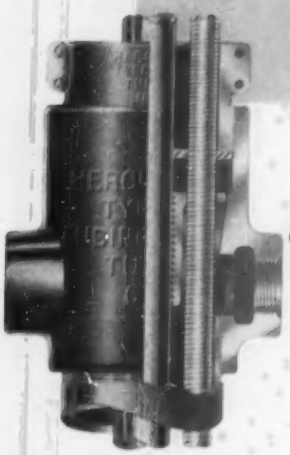
IN MEDIUM DEPTH WELLS

HERCULES "TYPE J-5-R" AND "RC" TUBING HEADS

DESIGNED FOR USE WITH REDA PUMPS

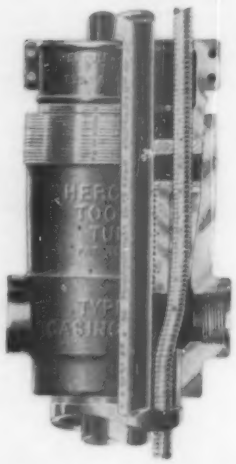


Designed for medium depth wells. Will suspend 5000 feet of 2" or 2½" Tubing or a proportionate amount of 3". Available in casing sizes from 5½" OD (which will suspend 2" or 2½" tubing only) to 7" OD which will suspend 2", 2½" or 3" tubing. Pressure cast steel body hydrostatically tested to over 4000 psi. 2" LP outlets furnished. (3" optional). Approximate over-all height, 14½".

Both heads feature the positive aligning hinged slips (which allow the electric cable to pass through the slips close to the tubing) and the overhead packing arrangement which packs off the tubing and electric cable simultaneously. The packing arrangement in both heads is tested to 2000 psi.

Built to support the weight of 10,000 feet of 2", 2½" or 3" Tubing, 5,000 feet of 4", or 4,500 feet of 5½" Casing. Available in casing sizes from 6⅝" to 9⅝" OD. 3" side outlets furnished. Pressure cast steel body tested to 4000 psi. Approximate over-all height, 23".

IN DEEP WELLS



"TYPE J-5-R" TUBING HEAD

SOLD AT ALL SUPPLY STORES

"TYPE RC" TUBING HEAD

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Manufacturers of Oil Field Equipment

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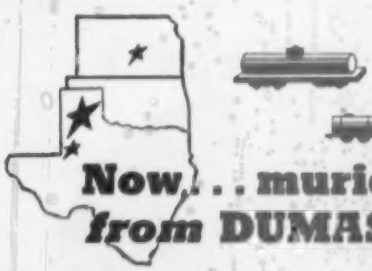

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1954-55 DIRECTORY

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THE OIL AND GAS JOURNAL
Box 1260 Tulsa, Oklahoma

Lawyer at the Helm

Shell Pipe Line's new head started in legal department

JOE T. DICKERSON of Shell Pipe Line Corp. has an unusual formula for success in the oil industry: Go through law school, join the legal department of a big oil company, and try to make yourself indispensable.

Dickerson doesn't claim to be indispensable to Shell Pipe Line, but he's the next thing to it. He's president.

A veteran in the Shell organization, Dickerson became president of Shell Pipe Line when T. E. Swigart retired October 1. Dickerson previously had served 3 years as vice president of Shell Oil Co.'s Midland, Tex., area in charge of exploration and production.

Dickerson first rubbed shoulders with Shell Pipe Line years ago when he was head of Shell Oil Co.'s legal department. That's when the company's main offices were in St. Louis.

"I worked on the same floor with those pipeline boys, and little did I realize then that someday I would be president of Shell Pipe Line," he recalls.

Native Kansan . . . Joe Dickerson was born at Marion, Kans., and studied law at the University of Oklahoma.

After receiving his law degree in 1923, he moved to Tulsa to join the legal department of Skelly Oil Co. He worked for Skelly until 1926, when he moved to the Shell organization.

Dickerson modestly admits his legal training "has been a great help" to him in the oil business. Most of his experience with Shell had been in the legal department prior to his recent transfer to Houston as president. He had been head of the legal departments in Tulsa, St. Louis, and Houston, and also had served as general attorney in the company's Houston office and as assistant secretary and manager of the head-office legal department in New York.

In 1946, with more than 20 years of legal experience behind him, he was named area manager for East Texas and the Texas Gulf Coast, with headquarters in Houston. He remained in that position until 1951, when he was named vice president and was transferred to the Midland district, which embraces the vast Permian basin and southeastern New Mexico.

In Air Force . . . Dickerson's career with Shell was interrupted during World War II. He joined the U. S. Air Corps' combat intelligence as a captain and wound up a lieutenant colonel.

Serving with a B-24 bomber group in Italy a little more than a year, he flew many bombing missions as an intelligence observer. He was in on one of the bombing runs over the Ploesti, Romania, refinery.

"One of my most pleasant experiences," he reminisces, "is that most of the fellows I worked with sort of confided in me. Since I was a lawyer, I was always helping them out in their personal legal problems back home, and it gave me great satisfaction in that I was able to help in my small way to make their work in the Air Corps more pleasant."

He rejoined Shell upon his return to the States, after serving 3 years in the Air Corps.

Work is hobby . . . Time spent by most men in hobbies is used by Dickerson in civic work.

During his last assignment in Houston, 1946-51, he served as chairman of the Community Chest budget committee and chairman of the board of directors of the Central Branch of the Houston Y.M.C.A.

In Midland, he was head of the Community Chest, president of the Chamber of Commerce, a member of the board of the Y.M.C.A., West Texas chairman of the Oil Industry information Committee, and vice president and member of the board of the Permian Basin Oil Show.

Dickerson is married and has one daughter, Carolyn.

Louis F. Davis has been appointed assistant regional manager of Oklahoma and Kansas by Atlantic Refining Co. Davis has been with Atlantic 19 years and before his appointment was general production superintendent at Dallas. Other Atlantic changes include: **Gordon T. Lepley,** district superintendent at Odessa, Tex., named operations manager for the Oklahoma-Kansas region; **J. P. Johnson,** promoted from reservoir engineer in Midland, Tex., to regional petroleum engineer for Oklahoma-Kansas region; **J. E. Hellinghausen,** formerly located in Midland, Tex., named regional drilling manager for the Oklahoma-Kansas region; and **Charles W. Alcock,** formerly district geologist at Jackson, Miss., named regional exploration manager for Oklahoma-Kansas region.

Milton F. Shaffer has been named operating vice president of Witco Oil & Gas Co., a wholly owned subsidiary

M. F. SHAFFER

O. J. LEVERITT

of Witco Chemical Co. Shaffer served as chief production engineer for Shamrock Oil & Gas Corp. before joining Witco. **O. J. (Jack) Leveritt** has been named secretary and head of the land department for the new company. Leveritt served with Gulf Oil Corp. and Columbian Fuel Corp. before joining Witco.

Dr. Robert H. Dodd has been named head of chemical engineering in the Oklahoma Institute of Technology, Oklahoma A. & M. College's engineering school. Dodd is widely known throughout the refining branch of the oil industry for his work as manager of the development engineering department of Lummus Co. of New York.

Eugene E. Woodward has been transferred to plant metallurgist at Shiprock, N. M., by the Navajo Uranium Division of Kerr-McGee Oil Industries, Inc. Before his move, Woodward had been serving as a chemical engineer with Kerr-McGee Research Laboratories in Oklahoma City.

R. W. (Dick) Jernigan, formerly vice president and general manager of Anderson International Contractors, Ltd., has resigned to form Majestic Con-

PERSONALS

Tri-Society Steering Committee Makes Plans

The 1955 annual meetings of three petroleum exploration societies—American Association of Petroleum Geologists, Society of Exploration Geologists, and Society of Economic Paleontologists and Mineralogists—will be held jointly in the Hotel Statler, New York City, March 28-31, 1955. Members of part of the steering committee are, seated, (left to right) Miss Angelina Messina, alternate New York chairman for S.E.P.M.; G. M. Knebel, general chairman; Edward A. Koester, president of A.A.P.G.; Robert H. Dott, executive director of A.A.P.G. Standing: Robert E. King, general vice chairman; Harvey Cash, alternate New York chairman for S.E.G.; and Fritz Von Estorff, past president of eastern section of A.A.P.G.

tractors, Ltd. The new firm will be headquartered in Edmonton with a branch office in Tulsa. It will specialize in engineering, survey, and aerial photography as well as pipeline construction.

W. M. Chappell, senior geologist with the Texas Petroleum Co., has been transferred from the Venezuela to the Peruvian division of the company. **D. R. Pendarvis** has been transferred from The Texas Co. in the United States to Texpet's Venezuelan company as production foreman.

H. R. Wall, superintendent of Continental Oil Co.'s refinery at Ponca City, Okla., has been promoted to regional manager of manufacturing for Conoco's southern and southwestern regions. Other promotions by Conoco include: **L. D. Grubb,** assistant superintendent at Ponca City refinery, advanced to superintendent to succeed Wall; **C. B. Round,** former assistant to the vice president in charge of manufacturing, promoted to assistant superintendent of Ponca City refinery; **J. M. Jones,** superintendent of the refinery at Lake Charles, La., promoted to the newly created position of manager at Lake Charles; **W. F. Brown,** superintendent of catalytic cracking at the Ponca City refinery, promoted to superintendent at Lake Charles; and **M. L. Cobb,** director of training for Conoco's manufacturing department, advanced to an assistant superintendent of the Ponca City plant to fill an additionally created position.

Landon B. Kelly has been promoted to drilling engineer and **Roy D. Patterson** to district production engineer at Corpus Christi, Tex., by Atlantic Refining Co. Other Atlantic promotions include: **James R. Fortner** to production foreman at Aransas Pass, Tex.; **Haskell A. Christian** to plant operator of the firm's Crane, Tex., plant; **Thomas O. Davis, Jr.,** to production engineer, Dallas; **Seth J. Abbott, James H. Foster, Mathew L. Freeman, Jr., Howard L. Kelley, James A. Le Velle,** and **Lenford K. Williams,** all to associate production engineers at Dallas; **Howard E. Greenwell,** to senior chemical engineer at Dallas; **Jack E. Hughes** to district geologist at Shreveport; **Homer L. Johnson** to junior gas engineer at Dallas; **Charles M. McDaniel, Jr.,** to district geologist at Jackson, Miss.; **Jasper L. Starnes** to district geologist at Roswell, N. M., **Robert E. Weldon,** to junior chemical engineer; **Robert Wilson** to associate research engineer at Dallas; **Dempsey L. Langston** to drilling engineer at Denver City, Tex.; **David J. Crumpton** to drilling engineer and **William E. Walker, Jr.,** to production foreman at Freer, Tex.; **Sidney Evans** to field engineer at Port Arthur, Tex.; **Victor Bychock** to regional geophysicist at Corpus Christi; **Irving C. Frary** to geologist at Midland; **Jesse P. Johnson** to regional petroleum engineer at Tulsa, and **Jack H. Vickery** to regional reservoir engineer at Midland.

Charles F. Urschel, Jr., San Antonio, Tex., oil and gas producer, has been appointed regional director for Europe for the Foreign Operations Administration. Urschel, whose oil interests include a managing partnership in the Slick-Urschel Oil Co., presidency of the Upton Gas Products Co. and part ownership of the Hewgley Drilling Co., will be responsible for FOA missions in some 10 European countries.

William S. Floyd, manager of the Pacific Coast purchasing department of the Shell Oil Co., Shell Chemical Co., and Shell Development Co., has been appointed assistant director for materials of the Office of Defense Mobilization. Floyd will be responsible for determining the quantity of materials required to meet the nation's defense and stockpile needs, and for the development of materials expansion and procurement programs for mobilization. He succeeds **Elmer H. Weaver,** who is returning to Union Oil Co.

James F. Blackwell has been transferred to Caracas, Venezuela, where he will continue to manage operations for the foreign producing department of The Texas Co. Blackwell has held the position since November 1, 1952, when he was transferred from the firm's domestic producing department.

Davis W. Reed, mechanical engineer with the Ventura, Calif., division of Shell Oil Co., has been promoted to mechanical engineer in the Los Angeles area office. Other promotions announced by Shell are: **Burton C. Carlson,** promoted from junior mechanical engineer in Los Angeles to mechanical engineer at Long Beach; **Jay R. Geddes,** advanced from junior mechanical engineer at Los Angeles to mechanical engineer at Ventura; **Edward B. Johnstone,** promoted from junior exploitation engineer at Salt Lake City to exploitation engineer at Salt Lake City; **Larry C. Kempton,** advanced from jun-

PERSONALS

ior mechanical engineer at Los Angeles to mechanical engineer at Bakersfield, Calif.; and **James A. Pramann,** formerly junior mechanical engineer at Los Angeles, transferred to New Orleans area.

W. L. Kygar, president of Continental Pipe Line Co., has been elected president of Cherokee Pipe Line Co., a recently organized firm owned 50-50 by Continental Oil Co. and Cities Service Oil Co. Other officers are **John L. Kelly,** Continental, vice president and general manager, products; **Ben D. Luety,** Cities Service, vice president and general manager, crude; **G. R. Preston,** Cities Service, vice president and treasurer; **F. B. Plank,** Cities Service, secretary; **John D. Morrow,** Continental, assistant secretary; **C. B. Wedum,** Cities Service, assistant secretary; and **R. E. Onstot,** Continental, assistant treasurer. Members of the board of directors are: **Kygar, Luety, Preston, T. A. van Griethuysen,** Continental; **K. W. Brill,** Continental; and **Harry Nelson,** Cities Service.

Frank G. McClintock, Tulsa, president of Zephyr Drilling Corp., has won the distinguished service award of American Association of Oilwell Drilling Contractors as the most outstanding chapter chairman in the nation during the 1953-54 year.

E. Allan Morrow has been elected president of Roosevelt Oil & Refining Corp., Mt. Pleasant, Mich., succeeding **John E. Boulder,** who has retired. Morrow has been associated with Roosevelt since 1933. Other officers elected were **Stanley Martin,** vice president; **Frank W. Horgan,** secretary and treasurer; and **T. J. Williams,** assistant secretary and assistant treasurer.

K. J. Reid has been promoted to district exploration superintendent by Stanolind Oil & Gas Co. at Oklahoma City. Other promotions to district exploration superintendent made by the company in its program of decentralization operations are: **G. C. Mahaffey,** Wichita; **Marvin Whitehead,** Shreveport; **J. G. Voight,** Tyler, Tex.; **J. M. Reed,** Lubbock, Tex.; **B. F. Baldwin,** Albuquerque, N. M.; **W. A. Blankenship, Jr.,** Roswell, N. M.; **N. T. Brasher,** Midland, Tex.; **T. S. Yancey,** Casper, Wyo.; **J. R. Willcockson,** Billings, Mont.; **J. W. Vanderbeek,** Bismarck, N. D.; **C. V. Walton,** Salt Lake City; **C. R. Barr,** Denver; **L. C. Ritts,** Lake Charles, La.; **T. D. Barber,** Houston; and **F. A. Bruner,** New Orleans. Men placed in charge of other exploration district offices are: **C. A. Houston,** Jackson, Miss.; **H. S. Edwards,** Abilene, Tex.; **A. C. Castle,** San Antonio; and **Caldwell Starkey,** Corpus Christi, Tex.

Named to Head A.A.O.D.C. for 1954-55

These men were elected by their fellow contractors at the recent American Association of Oilwell Drilling Contractors Convention in Los Angeles to head various divisions of the organization for 1954-55. The men selected are, seated (left to right): W. S. Fitzpatrick, Fitzpatrick Drilling Company, Corpus Christi, Tex., vice president, Gulf Coast; H. W. Davidson, Davidson Drilling Co., Midland, Tex., vice president, West Texas and New Mexico; Brad Mills, Dallas, executive vice president; J. V. Dunbar, Dunbar Drilling Co., Denver, president; C. F. Whaley, Chet Whaley Well Servicing Co., Houston, national vice president, and R. L. Manning, R. L. Manning Co., Denver, vice president, Rocky Mountains. Standing: R. L. Rose, Drilling & Exploration Co., Los Angeles, vice president, California; W. L. McClusky, M. J. Delaney Co., Dallas, secretary; J. K. Butler, Oil Production Maintenance, Houston, vice president, North and West Central Texas; John Moran, Moran Drilling Co., Wichita Falls, vice president; and Marion S. Church, Dallas, general counsel. New officers not pictured are, Herbert Woolf, Woolf & Magee, Tyler, Tex., vice president, Cretaceous and Tertiary basins; Gail C. Culter, Culter Drilling Co., Tulsa, vice president, cable tools; Dee A. Sikes, Helmerich & Payne, Tulsa, vice president, Central Mid-Continent; Alva C. Davis, Fairfield, Ill., vice president, Illinois, Michigan, Indiana, and Kentucky, and L. A. Beecherl, McDaniel & Beecherl, Dallas, treasurer.

Pleas Springer has been promoted to the geological department at Denver by Pure Oil Co. Before his promotion, Springer served as a scout in Oklahoma.

John Smithyman, petroleum engineer with Ohio Oil Co. at Robinson, Ill., has been transferred to the firm's Terre Haute, Ind., office.

C. Wilbur Brady has been promoted to assistant superintendent of gas and gas products by Sinclair Oil & Gas Co. at Houston. Before his promotion, Brady had been serving with Sinclair at Tulsa as an engineer in gas and gas products.

Floyd B. Inks, Jr., petroleum engineer with Gulf Refining Co., has been transferred from Houston to Laurel, Miss.

E. M. Baysinger, Monterey Oil Co., has been elected president of New Orleans Geological Society for 1954-55. Other officers are: **J. J. Crouere,** Natural Gas & Oil Corp., vice president; **L. W. Funkhouser,** The California Co., secretary; and **Ray A. Burke,** Union Oil Co. of California, treasurer.

DEATHS

F. C. (Bob) Miller, 60, independent operator of Shawnee, Okla., died October 18 from burns received as he was bringing in a well near Ottawa, Kans.

Herbert Stanley Lane, 64, executive vice president in Houston for Crown Central Petroleum Corp., was killed in an automobile accident near High Point, N. C., October 18. He had lived in Houston 23 years.

Dr. Raymond Foss Bacon, 74, former director of the Mellon Institute for Industrial Research and an inventor of petroleum and sulfur processes, died October 13 at his home in Bronxville, N. Y. Together with W. A. Hamor, Dr. Bacon authored several works, including, The American Petroleum Industry, and American Fuels. He also wrote numerous papers on chemistry and the technology of essential oils.

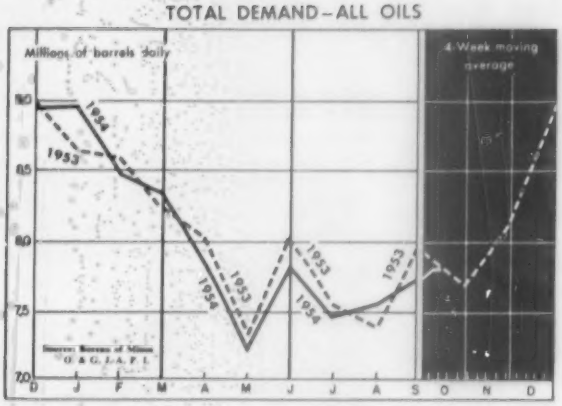
James N. Leonard, former geologist with Markay Oil Co. at Clayton, Mo., died recently in a St. Louis hospital. Leonard also had served with George Schoonmaker, Schlumberger Well Surveying Corp., and had been professor of geology at Evansville College in Evansville, Ind.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,197,925	UP	29,500	DOWN	136,009
Crude stocks	273,159,000	UP	3,075,000	DOWN	13,004,000
Completions	1,018	DOWN	72	UP	5
Refinery runs	6,765,000	UP	54,000	DOWN	101,000
Gasoline stocks	150,928,000	DOWN	622,000	UP	10,310,000
Four-product stocks	379,036,000	UP	1,754,000	UP	17,500,000
Total imports	866,200	DOWN	459,500	DOWN	117,500

TOTAL DEMAND—ALL OILS



Demand Increase for the Year Depends on Weather in Last Quarter

TOTAL demand for the first 9 months of this year was about 0.2 per cent less than for the same period in 1953, but the outlook for the last quarter is for enough gain over the fourth quarter of 1953 to produce a net gain of about 1.2 per cent for the year.

For the 12-month period ended September 30, total demand was down from the previous year in 8 of the months and up in only 4. At no time during the period was an increase over the previous year recorded for 2 consecutive months. A change in this trend is due to come in the current quarter.

Movement of distillate to secondary storage was heavy in September 1953, raising the total indicated demand for that month to more than 7,900,000 bbl. daily. This heavy buildup of secondary storage was followed by enough warm weather in October to bring demand for that month well below either September or October of the previous year.

Current movement of distillate fuels has lagged since the first of October, and total demand may be held to about 7,850,000 bbl. daily. This average will still represent an increase of about 2.2 per cent over the abnormally low level for October 1953.

The major gains for the season will come in November and December. If moderate weather continues through most of October, some refill purchases by both consumers and secondary suppliers will be postponed for several weeks. Since there was no big rush to fill consumer tanks in September, any delay of purchases in October will add to sales potentials for November and December.

If temperatures drop below normal in November and December, total demand will exceed the averages indicated in the table.

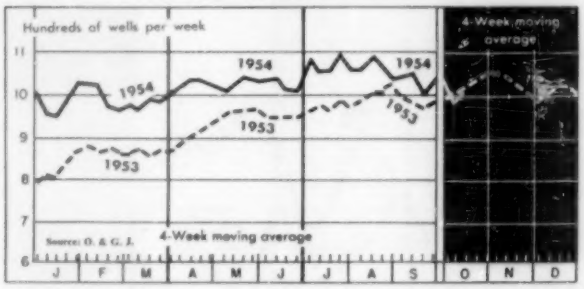
Increases in consumption of heating oils have not kept pace with gains in oil-burner installations. Part of this lag has been due to increased burner efficiency, but the important factor has been warmer-than-normal weather for the past few winters. Even normal weather will give demand a big boost.

TOTAL DEMAND
(Thousands of barrels daily)

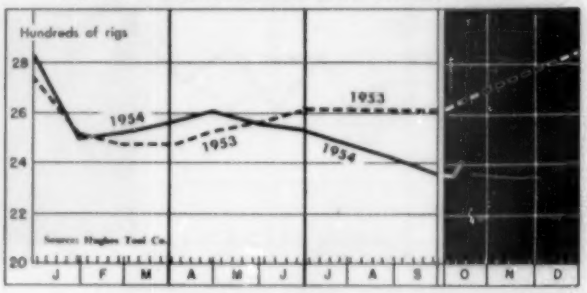
	1952		1953		1954	
	Vol.	Per cent increase	Vol.	Per cent increase	Vol.	Per cent increase
January	8,438	7.2	8,643	2.4	8,985	4.0
February	8,178	4.5	8,573	4.8	8,479	—1.1
March	7,663	1.5	8,244	7.6	8,366	1.5
April	7,636	7.3	8,018	5.0	7,834	—2.3
May	6,780	—3.9	7,339	8.2	7,210	—1.8
June	7,093	0.8	8,014	13.0	7,802	—2.6
July	7,078	0.1	7,529	6.4	7,485	—0.5
August	7,210	—2.3	7,398	2.6	*7,561	2.2
September	7,445	4.2	7,907	6.2	*7,734	—2.2
October	8,079	7.5	7,681	—4.9	†7,850	2.2
November	7,980	—1.3	8,117	1.7	†8,650	6.5
December	8,971	10.2	8,967	—0.04	†9,550	6.5

*Estimated. †Forecast.

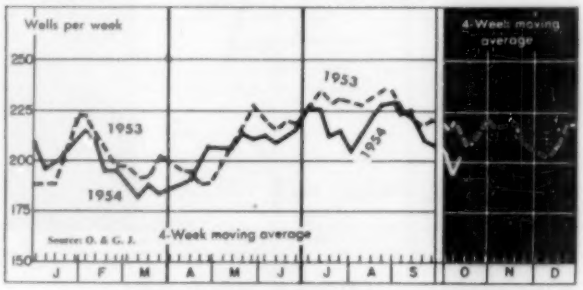
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS

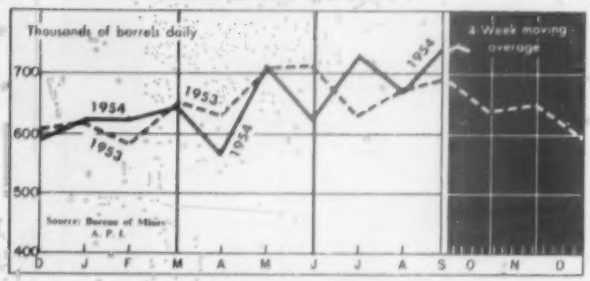
Area—	10-18-54	Change from 10-11-54	Change from 10-19-53
Gulf Coast	523	20	— 71
N. and W. Texas-New Mexico	734	2	—100
Arkansas-N. Louisiana-E. Texas	171	6	— 11
Oklahoma	300	6	— 66
Kansas-S. Nebraska	162	23	— 1
Illinois-Eastern	142	— 9	— 22
Rocky Mountain	250	5	— 45
Pacific Coast	128	— 4	— 34
Total United States	2,410	49	—350
Western Canada	151	5	— 19

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 16, 1954

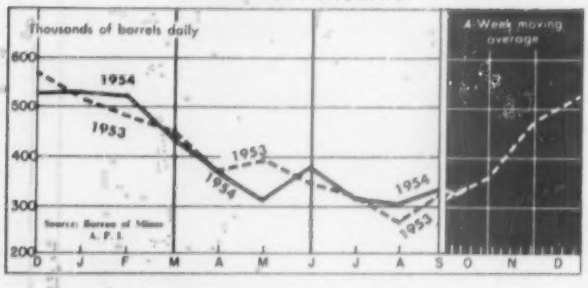
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1954	Cum. 1953	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1954: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	0	0	0	0	0	86	115	0	0	0	0	0	2	0	2	75	79
Arkansas	18	12	0	6	63,397	519	430	1	0	0	1	2	21	0	4	97	122
California	47	30	2	15	261,479	1,877	2,048	1	0	1	10	12	49	1	11	408	469
Colorado	25	2	3	20	141,912	1,043	553	0	0	0	15	15	28	0	15	431	474
Illinois	10	1	0	9	18,382	§2,347	1,584	1	0	0	9	10	§17	0	0	§330	§347
Indiana	18	4	0	14	25,564	629	1,024	0	0	0	7	7	8	0	1	117	126
Kansas	84	56	2	*26	314,869	3,633	3,905	6	0	0	8	14	70	0	20	480	570
Kentucky	13	9	0	4	18,191	888	884	0	0	0	0	0	14	0	3	93	110
Louisiana	69	35	3	31	427,402	2,789	2,128	2	0	2	13	17	88	45	31	279	443
North	37	22	1	14	134,767	1,545	918	1	0	1	8	10	15	3	12	119	149
South	32	13	2	17	292,635	1,244	1,210	1	0	1	5	7	73	42	19	160	294
Michigan	16	10	0	6	53,107	446	480	1	0	0	5	6	14	0	0	164	178
Mississippi	10	2	1	7	60,511	328	299	0	0	0	5	5	9	1	0	120	130
Montana	6	4	0	2	28,097	256	345	2	0	0	2	4	6	0	2	85	93
Nebraska	12	6	0	6	70,593	343	263	0	0	0	5	5	21	0	3	106	130
New Mexico	26	10	12	4	114,923	862	1,142	0	0	1	2	3	13	0	16	86	115
North Dakota	8	4	0	4	50,469	242	208	0	0	0	2	2	4	0	0	88	92
Ohio	23	9	7	*7	49,550	906	864	0	0	0	0	0	3	0	5	13	21
Oklahoma	193	104	12	†77	630,069	7,232	5,961	5	0	0	12	17	103	3	21	527	654
Pennsylvania-New York	33	10	10	‡13	117,100	1,831	2,099	0	0	0	0	0	0	0	6	33	39
Texas	374	214	9	151	1,681,071	14,741	13,621	9	1	4	85	99	631	62	141	3,334	4,168
Southwest (1 & 4)	56	24	3	29	218,060	2,096	2,210	1	0	0	13	14	90	24	38	568	720
Gulf Coast (2 & 3)	47	25	2	20	302,968	2,127	1,983	1	1	1	11	14	66	32	42	536	676
East (5 & 6)	25	18	0	7	123,303	777	643	2	0	0	5	7	15	0	13	234	262
North Central (7-B & 9)	125	68	0	57	378,959	5,515	5,167	4	0	0	27	31	286	4	18	1,331	1,639
West (7-C & 8)	117	77	3	37	642,399	3,439	2,997	1	0	3	29	33	170	0	22	595	787
Panhandle (10)	4	2	1	1	15,382	787	621	0	0	0	0	0	4	2	8	70	84
Utah	0	0	0	0	0	63	53	0	0	0	0	0	3	0	1	36	40
West Virginia	17	0	14	3	49,957	484	485	0	0	0	0	0	0	0	25	15	40
Wyoming	16	11	0	5	76,196	1,007	623	2	0	0	2	4	32	0	6	153	191
Miscellaneous	0	0	0	0	0	97	71	0	0	0	0	0	3	0	0	28	31
Total United States	**1,018**	533	75	410	4,252,779	§42,504	39,185	30	1	8	183	**222**	§1,139	112	313	§7,089	§8,662
Total previous week	1,090	592	98	400	4,282,361			28	3	6	168	205	1,101	111	305	6,827	8,344
Total October 17, 1953	1,013	523	72	418	3,931,561			17	2	3	165	187	1,163	87	294	7,265	8,809

Service wells included: *1, †17, ‡8. §Revised.

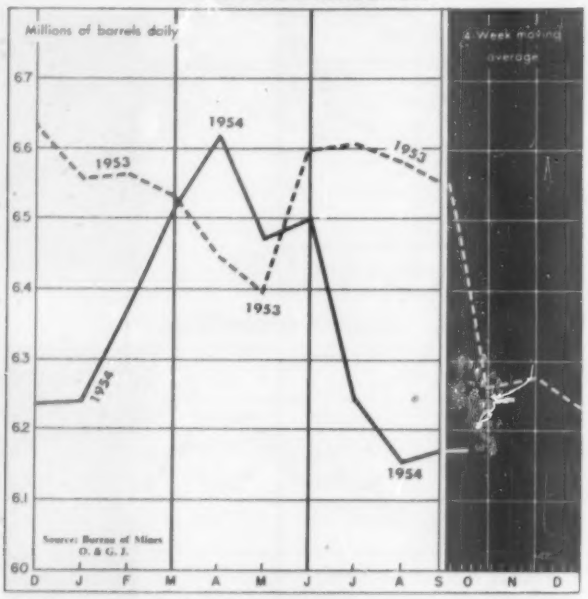
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



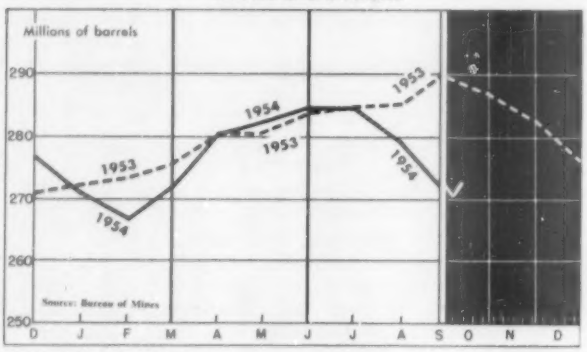
DAILY AVERAGE PRODUCTION FOR WEEK

	October 16 — Crude oil	Lease condensate	Total	Oct. 9 total
Alabama	4,000		4,000	4,100
Arkansas	75,550	450	76,000	76,800
California	961,100		961,100	968,200
Colorado	132,900		132,900	134,500
Eastern	53,500		53,500	53,500
Florida	1,575		1,575	1,575
Illinois	190,700		190,700	184,400
Indiana	28,700		28,700	27,600
Kansas	318,100		318,100	313,400
Kentucky	37,000		37,000	37,100
Louisiana	585,000	41,700	626,700	625,300
North	105,000	2,700	107,700	106,300
South	480,000	39,000	519,000	519,000
Michigan	32,400		32,400	31,000
Mississippi	88,200	3,000	91,200	91,400
Montana	41,300		41,300	39,800
Nebraska	19,200		19,200	19,600
New Mexico	204,625	2,250	206,875	206,675
Oklahoma	501,200		501,200	480,800
Texas	2,550,000	47,575	2,597,575	2,597,575
Dist. 1	42,400	400	42,800	42,800
Dist. 2	129,500	7,550	137,050	137,050
Dist. 3	398,800	22,300	421,100	421,100
Dist. 4	226,000	5,300	231,300	231,300
Dist. 5	42,500	425	42,925	42,925
Dist. 6	107,000	4,600	111,600	111,600
East Texas field	203,800		203,800	203,800
Dist. 7-B	134,000	25	134,025	134,025
Dist. 7-C	171,000	4,600	175,600	175,600
Dist. 8	820,000	2,000	822,000	822,000
Dist. 9	188,000	350	188,350	188,350
Dist. 10	87,000	25	87,025	87,025
Utah	5,300		5,300	5,300
Wyoming	257,900		257,900	254,600
North Dakota	14,400		14,400	14,900
Miscellaneous	‡300		‡300	‡300
Total U. S.	6,102,950	94,975	**6,197,925**	6,168,425
Change from previous week, up			**29,500**	
Canada	†295,400		†295,400	†253,800

Total U. S. Production January 1-October 16 — 1,832,683,500 bbl.
Same period last year-(crude plus cond.) — *1,885,846,203 bbl.

*Includes 26,211,250 bbl. condensate. †Week ended previous Monday. ‡Includes S. D. 100, Nev. 200.

CRUDE-OIL STOCKS



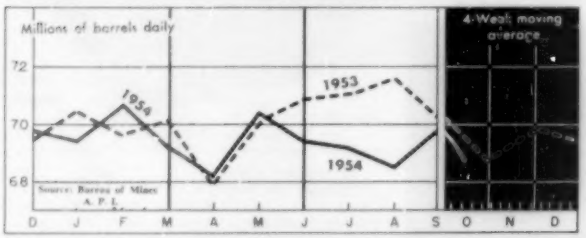
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

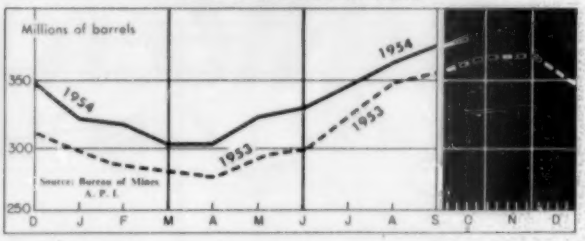
	Oct. 9, '54	Oct. 2, '54	Oct. 10, '53
Pennsylvania Grade	3,031	3,091	2,853
Other Appalachian	1,681	1,626	2,181
Illinois, Indiana, Michigan	12,480	13,014	12,274
Kansas	10,397	10,196	10,552
Oklahoma	25,769	24,726	31,910
Arkansas	3,327	3,399	3,364
Louisiana	15,704	15,879	17,481
North	2,513	2,515	2,955
Gulf	13,191	13,364	14,526
Mississippi	2,969	2,890	3,657
New Mexico	8,683	8,769	9,057
Texas	127,486	126,834	132,777
East Texas proper	10,999	10,876	11,909
West Texas	56,668	56,251	58,669
Texas Gulf	25,747	25,115	28,910
Other Texas	34,072	34,592	33,289
Wyoming	12,856	12,644	13,716
Other Rocky Mountain	5,006	4,764	2,724
California	32,388	32,081	33,038
Foreign	†11,382	10,171	10,579
Total	273,159	270,084	286,163

*Bureau of Mines. †Includes 2,939,000 bbl. in California.

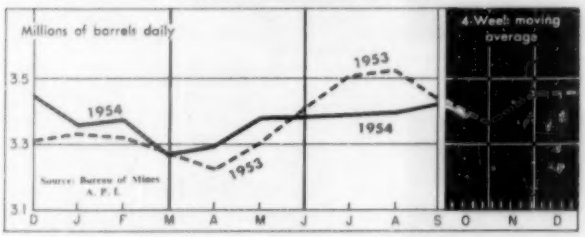
REFINERY RUNS



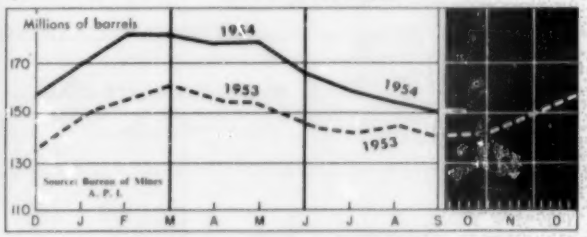
FOUR-PRODUCT STOCKS



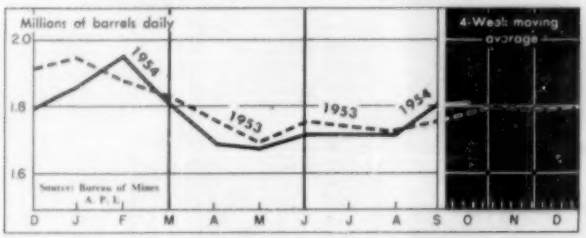
GASOLINE PRODUCTION



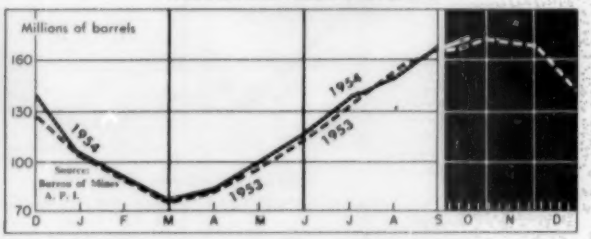
GASOLINE STOCKS



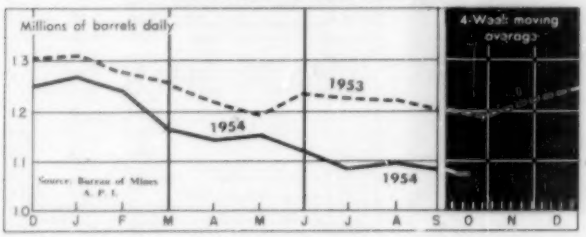
MIDDLE-DISTILLATE PRODUCTION



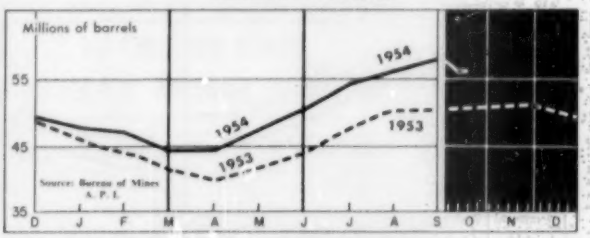
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, OCTOBER 15

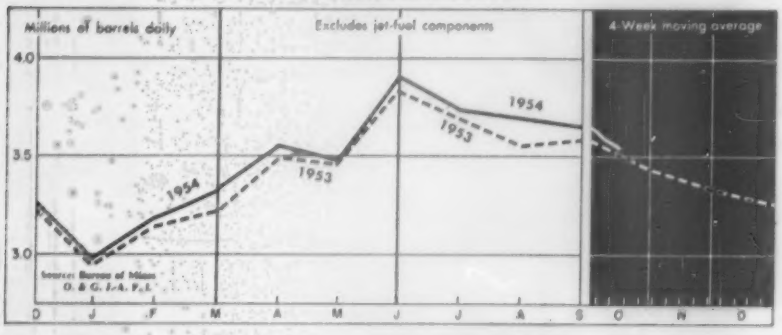
(Excludes all jet-fuel components)

(Thousands of barrels)

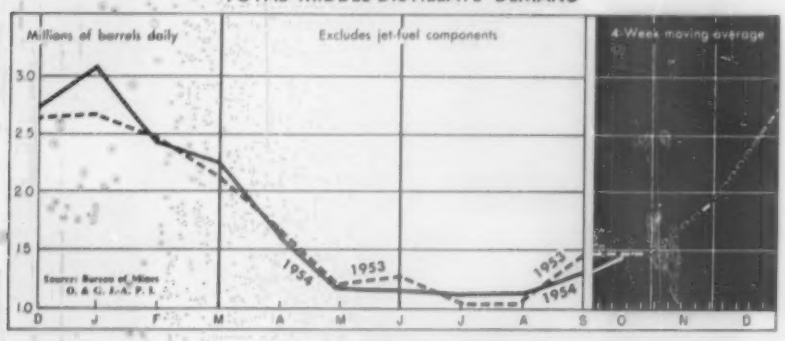
District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1953—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,014	400.2	7.6	286.0	199.4	34,639	15,399	49,268	10,630	1,009	428.7	33.8	256.1	209.9
Appalachian:														
District 1	103	44.4	4.7	21.3	5.8	4,297	776	2,768	469	109	46.2	6.2	17.1	11.2
District 2	68	38.7	7.1	11.6	6.6	2,330	455	777	362	85	46.2	4.3	13.0	12.5
Ind., Ill., Ky.	1,184	641.3	83.0	214.1	144.6	33,081	9,989	25,786	4,402	1,269	703.2	86.9	224.2	169.4
Okla., Kans., Mo.	596	324.4	16.4	145.3	40.9	13,480	2,451	13,186	1,298	565	330.7	10.6	138.9	49.0
Inland Texas	222	171.7	9.0	42.4	20.6	5,647	299	2,357	1,267	250	180.8	11.7	44.2	29.7
Texas Gulf Coast	1,638	796.0	106.0	362.9	241.6	20,028	4,343	16,498	6,198	1,639	822.9	131.6	383.8	235.0
La. Gulf Coast	606	282.9	73.3	150.3	32.7	9,346	3,457	4,918	1,248	548	273.8	53.5	150.2	43.7
N. La. and Ark.	88	33.0	6.6	21.3	5.6	4,202	1,024	1,477	127	90	38.2	7.2	20.1	7.2
Rocky Mountain:														
New Mexico	17	9.7		3.1	2.4	262		86	34	20	12.6	0.4	3.0	3.9
Other Rocky Mtn.	218	98.4	4.4	53.9	35.1	5,376	234	2,542	794	225	110.4	2.0	52.4	40.7
California	1,011	458.6	7.3	139.7	372.6	18,240	369	13,465	29,355	1,063	443.3	6.9	159.3	372.2
October 15, 1954	6,765	3,299.3	325.4	1,451.9	1,075.9	150,928	38,796	133,128	56,184	6,872	3,437.0	355.1	1,462.3	1,184.4
October 8, 1954	6,711	3,304.4	286.4	1,536.0	1,002.3	151,550	38,480	131,198	56,054					
October 17, 1953	6,866	3,388.1	367.0	1,478.7	1,180.4	140,618	37,164	130,651	53,103					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

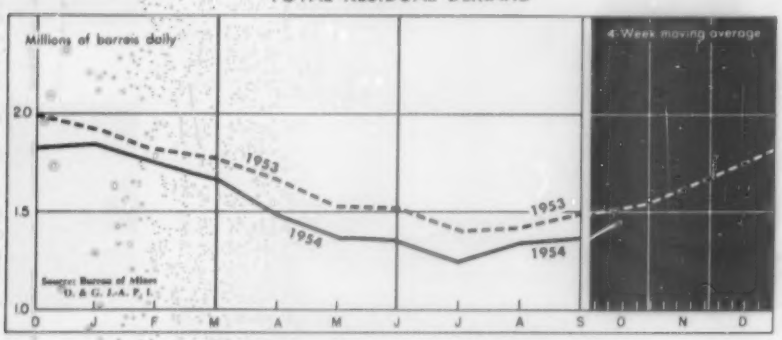
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of October 20, 1954. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.25-11	11.25-12	10.50-10.75
Premium gasoline	11.25-12	13-13.75	11.50-11.75
42-44 w.w. kerosine	9-9.25	10.10	9-9.25
No. 2 straw fuel oil	8.25-8.5	9.35	8.5
No. 6 residual	$1.30-1.35	$2.25-2.35	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.0	4.5	4.75
Grade 18-55	6.0	5.5	5.75

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX
Mid-Continent

132-134 A.M.P.	6.0

• Lack of cold weather has restricted activity in the heating-oil market. The Group 3 gasoline market is softer in tone but actual spot-sale prices are still reported at about the same amount under normal posting as for the past several weeks.

PRODUCTION AND DEMAND MAJOR PRODUCTS
(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 10-15-54	3,378	3,528
July 1954	3,385	3,723
September 1953	3,432	3,579
October 1953	3,359	3,423
Middle distillate:		
Four weeks ended 10-15-54	1,805	1,461
July 1954	1,711	1,106
September 1953	1,745	1,453
October 1953	1,793	1,479
Residual fuel:		
Four weeks ended 10-15-54	1,069	1,441
July 1954	1,089	1,243
September 1953	1,203	1,498
October 1953	1,184	1,521

CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9	....	2.76	3.09	2.63
34-34.9	....	2.78	3.11	2.65
35-35.9	....	2.80	3.13	2.67
36-36.9	....	2.82	3.15	2.69
37-37.9	....	2.84	3.17	2.71
38-38.9	....	2.86	3.19	2.73
39-39.9	....	2.88	3.21	2.75
40 and above	....	2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, September 1, 1954.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.23
Middle District	3.15
Southwest Pennsylvania	2.81
West Virginia	2.70
Ohio	2.74
Illinois Basin	2.90-3.02

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FOR SALE EQUIPMENT

HIGH PRESSURE EXCHANGERS: 56 new GRISCOM-RUSSELL CSS-248 twin G-FIN sections, with 1½" 4000 p.s.i. W.P. steel tubes and 3½" 1500 p.s.i. steel shells. Connections are beveled for welding. Surplus prices. Available immediately. Please contact MALONEY-CRAWFORD. Box 659, Tulsa, Phone 3-6234.

FOR SALE: 3600' 4½" extra hole drill pipe, good for shallow drilling, $.90 per foot. Terms. Melton Supply Company, Box 1360, Seminole, Okla.

ROTARY RIG COMPLETE: 2,500 to 5,000 ft. capacity. Easily Portable. 4½-in. drill pipe. Double derrick, 7-ft. substructure, Model "S" Cardwell drawworks, 14-in. Gardner-Denver pump powered by LRO Waukesha. Located Grady County, Okla. R. V. Dillard, Phone 1177 or write Box 992, Duncan, Okla.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

USED EQUIPMENT

Franks East Texas Unit, mounted on K-10 International Truck. Located in Seminole area.

Franks Model 65/44 DTRD Double Drum Trailer Mounted Workover and Drilling Rig. Serial 1327 96', 150,000# Telescoping Derrick. Located at Alice, Texas.

Franks 7000 Single Drum Skid Swabbing Unit mounted on Dodge Tandem Truck. Located Odessa, Texas.

Franks SAL 4500 Skid Rotary Rig Cummins Power, 96' Derrick. Located, Tulsa, Oklahoma.

O.C.S. Type 3 Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

Franks Super Senior Well Servicing unit 8 x 10 x 62 Single Pole Mast mounted on Tandem International Truck, Located Seminole, Oklahoma.

Write, wire or call Franks Mfg. Corporation, Box 3218, Whittier Station, Tulsa, Oklahoma.

FOR SALE EQUIPMENT

TANKS FOR SALE: 3—40,000 Bbl., 2—37,500 Bbl., 1—17,500 Bbl., 5—500 Bbl., 6—250 Bbl., 1—210 Bbl., 2—160 Bbl., 1—150 Bbl., 2—140 Bbl. Fairway Pipe & Supply Co. Inc. P. O. Box 6627, Cedar Grove Station, Shreveport, Louisiana. Phone 8-1473.

FRANKS MODEL 5000—$7,500: 1-Cummins HBI-600 engine in good condition equipped with spudding attachment, skid and 65' double leg (8⅝ x 7" legs) mast. Call Amherst 73311 Wichita, or write P. O. Box 2001, Wichita, Kansas.

FOR SALE—In Seminole Area 8—10' x 40' riveted and welded horizontal gasolene storage tanks. Cities Service Oil. Patridge, Bartlesville, Oklahoma.

FOR SALE—Bridgeport No. 8 pumping Jack: 32 to 36 inch stroke. Beam weights, crank weights and motor base complete. Excellent condition. Price $750. Howard Gault, 915 So. Main, Ottawa, Kansas.

REFRIGERATION UNIT—15 ton, gas engine drive, skid mounted, aerial condenser, flooded chiller. Adaptable most any additional cooling requirement. Ideal for increasing compression liquid production. For information and picture write Rm. 31, 130 Casa Linda Plaza, Dallas, Texas.

FOR SALE EQUIPMENT

1 CARDWELL CABLE TOOL beam type drilling-in unit complete with tool house, light plant, model 145GKU Waukesha Motor, 5" and 7" tools, and new 5,000 ft. sand and drilling lines. For inspection contact L. D. Hedrick or C. R. Moore, Great Bend, Kansas office or M. C. Hagar, McPherson office.

Save $1090.00 Each

New Waukesha Engines

3—Model 6NKU Engines with gasoline-engine starting and standard oilfield accessories, less power take-offs. Price at Tulsa—$6400.00 each.

LUCEY PRODUCTS CORPORATION
624 South Cheyenne Phone LD 204
TULSA, OKLAHOMA

SACRIFICE SALE

2 NEW CLIMAX MODEL V-80 ENGINES

Carries manufacturer's guarantee. 8 cylinders; Displacement, 2155 cu. in.; 7" bore, 7" stroke; 1050 RPM. Units include: Engine with Water Pump; Flywheel & Ring Gear; #00 SAE Flywheel Housing; High Compression Cylinder Heads; Intake Manifold; Water Inlet and Outlet Manifolds; Breather Assembly; Magneto Ignition (2 Magnetos) with Spark Plugs and Cables; Mechanical Governor; Instrument Panel with Ignition Swith, Oil Pressure Gauge, Vacuum Gauge and Controls; Thermometers (3) on Water Outlet Manifolds; Cast Iron Box Type Base (Oil Pan); Water Cooled Exhaust Manifold, Radiator, Fan & Fan Guard; Oil Bath Air Cleaners (Vortox); Natural Gas Carburetion, including Regulators; Oil Filter—Deluxe; Safety Devices including High Water Temperature & Low Oil Pressure Cut-Out Switches. Shipping Weight, 12,600 Lbs. Specification No. MS-5206D. Also equipped with Twin Disc Clutch Power Take-off X-7189½, B-218P.

BOX H-474, THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

FOR SALE

BETHLEHEM MC-650 RIG

Available for immediate delivery; located West Texas; MC-650 Drawworks with 3-engine chain compound; 3 Waukesha LRO engines; Bethlehem 350-ton derrick equipment; Bethlehem pumps, rotary table, etc. 136' standard derrick, Shaffer Blowout Preventer, rig up items, etc. Bargain for quick sale.

BOX H-461, THE OIL AND GAS JOURNAL,
Tulsa, Oklahoma

FOR SALE EQUIPMENT

FOR SALE 5000' RIG—1 250 Bethlehem complete drilling rig less derrick and drill pipe. Compound with two D-13000 Cats and 14 inch Bethlehem pump. Located: Wampler Bros., Box 1987, Longview, Texas. Phone PL 92312.

NEW—UNUSED

1—Worthington type M-25 6 6 x 5 x 5, two stage air cooled air compressor. Compressor operates at 870 RPM with piston displacement of 142 CFM and an actual free air capacity of 110.8 CFM at 125 PSI discharge pressure. Complete with radiator intercooler, fan, suction muffler, filter, oil gauge, structural steel base plate extended and direct connected through flexible coupling to General Electric 900 RPM 25 HP, 3 Phase, 60 Cycle 440 Volt, open frame induction motor.

PRICE $1,900.00

1—1½ x 2 VTE Worthington Power Pump all iron fitted with ceramic plungers. Displacement 10.26 GPM at 420 RPM at 1200 Discharge Pressure. 20 HP Motor Load.

PRICE $2,000.00

Call or write

H. K. DIXON, PLOMO COMPANY,
Robstown, Texas

FOR SALE 5500' RIG

Bethlehem "BREEZE" 17½" Rotary with 87' Cantilever Mast, Waukesha WAKE Power Unit, Torque Converter Gardner-Denver 14" mud pump, DV4A Hinderliter Blowout Preventer. Fully equipped with 6 drill collars and 4900' of 4½" drill pipe, 5 KW light plant. Less than 30,000 feet of hole drilled.

Also 3500' Emsco Rig with 84' tubular derrick, 12" mud pump, 3 drill collar and 3000' of 3½" EUE drill pipe.

HUBERT E. BALE
Rodgers Bldg., 6730 Snider Plaza
Phone: LOgan 8597 Dallas 5, Texas

EQUIPMENT SPECIALS!

Columns: 8' x 28', 7' 6" x 56', 7' 4" x 70', 7" x 5' x 70', (2) 7' x 57' (400#), 7' x 42', (3) 6' x 63', 6' x 27', 5' x 62', 4' x 72', 4' x 47', (250#), 3' 6" x 63', 3' x 16', 2' 6" x 60', 2' x 75', 2' x 45' (250#).

Heat Exchangers:

(5) 1,660 59' (Adm.), (2) 1,125 sq. ft. (850 lb.), 1000 sq. ft., 600 sq. ft. (Adm.), (5) 424 sq. ft. (Adm.), (5) 360 sq. ft., (4) 260 sq. ft.

60 - Turbine driven centrifugal pumps, SS & Steel, 1" x 1" to 8" x 8".

2—6 stage Pacific pumps 730 GPM. 2,000 ft. hd.

2—Clark MA 4 150 BHP engines.

4 I-R XVG-8 engines.

Gould 16" 10,500 GPM. Pump.

Oliver Filters: 8' x 10', 5' 3" x 8'.

5' x 12', 4' x 6' Drum Flakers.

Lab. Petrochem Furnace.

Detailed circular upon request.

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, Locust 1351

Sell us your surplus equipment

FOR SALE EQUIPMENT

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

FOR SALE: Sullivan 200 complete with all tools ready to work. Located Tulsa, Okla. Contact R. F. Mesker, Phone 6-0037 or 5-9357, Tulsa.

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126 Herndon Drilling Company, 421 Mayo Building, Tulsa, Phone 4-9700.

WELL DRILLING EQUIPMENT. New and used spudders, rotaries, core drills. Tools pipe, cable. Everything for well drilling. Fishing tools rented. Pressey & Son, Pueblo, Colo.

WATER FLOOD EQUIPMENT located near Norris City, Illinois. One water softener consisting of one CBZ-175 accelerator mechanism complete with 14 feet x 13 feet welded steel tank, one No. 72 Forced Draft Aerator, two motor driven centrifugal pumps, two 9-D chemical feeders, two No. 1 suction boxes and miscellaneous fittings. Shell Oil Company, Centralia, Illinois.

FOR SALE—In Lindsay, Oklahoma field, 7—high 500 bbl. erected flat seam used bolted steel tanks. Price $350.00 each, as is. Contact T. P. Mace, ME 6-3331, Oklahoma City, Cities Service Oil, Patridge, Bartlesville, Oklahoma.

KEYSTONE 5½ SPUDDER—complete with all tools: 50 Horse Le Roi engine, butane tank, light plant and tool house. Recently overhauled. Excellent condition. Price $4500. Floyd Jackson, Rantoul, Kansas, Phone 58.

FOR SALE

4800' of 4½" OD 16.60# Grade D Drill Pipe, internal flush, Range 2, with Hughes counter bore weld tool joints. This is not junk pipe and has been checked by Sonoscope Company. 3250' #2 Sonoscope Pipe and 1554' #3 Sonoscope Pipe. Priced for quick sale—#2 at $1.30 per foot and #3 at $1.00 per foot, f.o.b. location Harvey, Louisiana. Subject to inspection and prior sale. If interested write

THE NATIONAL SUPPLY COMPANY,
Tulsa, Oklahoma

Or call Mr. McFarland—Phone 2-6101

Special Quantity Prices

IN TRUCKLOAD AND CARLOAD QUANTITIES

77,500 feet
8⅝" O.D. 28.55 lbs. per ft.

16,000 feet
12¾" O.D. 49.56 lbs. per ft.

Machine cleaned—Beveled ends

20 foot random lengths

Complete inventories of new and used Steel Pipe in all diameters from ½" through 30".

WRITE - WIRE - PHONE

SONKEN-GALAMBA CORPORATION
2nd and Riverview (X-190)
Kansas City 18, Kansas
ATwater 9305

EQUIPMENT WANTED

CAST IRON PIPE, fittings, H. E. Gate Valves, new or used. Advise price and quantity first letter. R. E. Kershaw, P. O. Box 944, Muskogee, Oklahoma.

CONTINUOUS PROFITABLE work for one medium rotary rig for share in profit. Box H-458, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Greer Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WE PAY THE MOST for Used Line pipe, used casing, abandoned leases. Gore Oil Field Supplies. Box 1063, Tulsa, Okla.

HELP WANTED

REFINERY SUPERINTENDENT. Chemical or mechanical engineer, under 40 with 10 years' experience in natural gasoline plant and refinery topping operation, to supervise modern plant recently constructed in Ecuador, South America. Knowledge of Spanish advantageous. Reply by letter, enclosing snapshot and full details of experience and education, to Manabi Exploration Company, Inc., 1615 Bank of Commerce Building, Houston, Texas.

PHYSICAL CHEMIST or Physicist, Continental Oil Company, Ponca City, Oklahoma. Immediate opening for physical chemist or physicist. Advanced degree, Ph.D. preferred. Research work in Petrophysics group, Production Research Division. New laboratory building. Excellent benefits and working conditions. Address letter giving education, experience and salary requirement to Personnel Records Division, Continental Oil Company, Ponca City, Oklahoma.

YOUNG OIL TAX ACCOUNTANT, preferably with college and some experience, to work in New Mexico. Good opportunity for someone not afraid to work, who is congenial and will assume varied responsibilities. Reply should include details, references and starting salary expected. Box H-463, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST or Reservoir Engineer, experienced in subsurface geological work, estimation of reserves and deliverability studies required in connection with FPC hearings and financing. Age preference 35 to 40. Headquarters in Houston. Gulf Coast experience necessary. Good salary for quick worker with the required experience and qualifications. Box H-476, The Oil and Gas Journal, Tulsa, Oklahoma.

PIPELINE DEPARTMENT OF MAJOR OIL COMPANY HAS OPENING FOR A TOP-NOTCH MACHINIST.

Individual selected must be thoroughly experienced in operation and maintenance of diesel and electric motors, centrifugal pumps and electrical controls. Past experience in supervisory capacity desirable. Write P. O. Box 7540-A, Chicago 80, Illinois. Attn.: Superintendent, Industrial Relations.

PETROLEUM ENGINEERS

Experienced graduate engineers or recent graduates, for immediate and future job openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

Salaries commensurate with education and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 79

ARABIAN AMERICAN OIL CO.
505 Park Avenue, New York 22, N. Y.

URGENTLY NEEDED

Refinery Maintenance Supervisor

Under 45. Graduate Engineer preferred. Salary to $10,000. Must have good refinery maintenance experience. Our fee paid. All replies confidential. Send complete resume to Chas. J. Loveless Personnel Service, 616 S. Main, Tulsa, Okla. Phone 4-3193.

FOR A BETTER-PAID JOB

Production and Reservoir Engineers, Geologists, Draftsmen; Geophysicists, Party Chiefs, Computers and Field Crew Staff. WRITE US—STRICTEST CONFIDENCE.

GOOD EMPLOYMENT AGENCY
1554 California, Denver. AC 0835

WANTED

An Able Refinery Manager for Middle East Country

Excellent Compensation
3 - 5 Year Contract with Liberal Provisions

We are seeking a man 40-55 years of age (perhaps older) with experience and fully capable of managing a 25,000 b.p.d. oil refinery located in Middle Eastern country. He must be able to assume full responsibility for the successful operation of this new refinery. Will have freedom to select American personnel needed for other top positions but over the years he will be expected to develop local people for as many key positions as possible. No oil company is involved as this operation is owned by the foreign government who will make a liberal contract with excellent compensation. Location and housing desirable. Because of tax advantages, this is attractive to an older, experienced man who would like to work for five or more years longer or for a younger, experienced man who would like a stimulating career. Please give complete details and personal history.

BOX H-456, THE OIL AND GAS JOURNAL, TULSA, OKLAHOMA

WANTED: Distributor for Gas Lift equipment in Louisiana. Two territories now open are Shreveport area and Lafayette area. Prefer Engineering background but will give consideration to experience. Macco Oil Tool Co., Inc., P. O. Box 7288, Houston 8, Texas.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

GEOLOGIST—Senior Research, to work in New York. Applicant should have advanced degree and broad experience in petroleum geology, foreign and domestic. Work involves compilation of geological data, evaluation of foreign petroleum prospects and preparation of reports. Important petroleum organization offers this position of responsibility and appeal to the right party. Pay commensurate with education and experience. Age range, preferably 35 to 50. Submit resume in detail. Box H-417, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 4 or 5 years experience with emphasis on valuation and Reservoir Engineering. Must be free to travel with Dallas as headquarters. Initial letter application should set out past experience in detail, education and salary requirements. Box H-465, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST—Six years experience in South and East Texas, desires immediate connection with active company. 1628 North Boston, Tulsa, Okla.

PETROLEUM ENGINEER, 26, single, veteran, 2 years experience in foreign drilling. Excellent knowledge of Spanish and Arabic. Desire foreign career with organization offering opportunity for advancement. Available immediately. Box H-470, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, (Master's Degree), with Major Oil Company desires change to another responsible position. Please state duties, responsibilities, salary and advertiser will furnish all details requested. Box H-472, The Oil and Gas Journal, Tulsa, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited.

Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY

P. O. Box 1628, Hobbs, New Mexico, Phone 3-3141.

146 Allen Building, Midland, Texas, Phone 2-2962.

SITUATIONS WANTED

MR. PRESIDENT:

Why not concentrate on operations and let me assume responsibility for finance and accounting? Have experience in all phases of Oil industry including ten years as Controller, Treasurer, Financial Vice President and Director. Have B.C.S. Degree and am qualified to reorganize accounting personnel and procedures if necessary. Will invest in progressive Company. Box H-459, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT—BBA degree accounting major familiar with drilling, production, joint interest, taxes, land and lease work, desires connection with independent. Capable of full charge of office. Age 45. W. R. Andrews, 128 Main Plaza, San Antonio, Texas.

PETROLEUM ENGINEER, 10 years varied production, drilling and management experience. Desires responsible position with independent or individual. Box H-468, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN OR DOMESTIC — Excellent background with references to qualify in Materials, Purchasing, Sales, Managing, Office or Warehouse work. Box H-469, The Oil and Gas Journal, Tulsa, Oklahoma.

PIPELINE Superintendent-Engineer. Age 35, M.E. Degree, 2 years general engineering, 7 years crude and products pipeline design, construction, maintenance, operation. Full resume on request. Presently employed major oil company Eastern U. S. Desire Rocky Mountain or Southwest location. Salary secondary to location and opportunities. Box H-471, The Oil and Gas Journal, Tulsa, Oklahoma.

SOIL ANALYSIS

SOIL ANALYSIS—fascinating new business. Do it yourself, write for details. Surface Oil Surveys, 1414 Electric Bldg., Fort Worth, Texas.

PRODUCTION WANTED

NEWLY ORGANIZED syndicate wants to buy 5,000 to 30,000 barrels oil monthly production. You will deal direct with principals. Prompt action. Evaluation report must accompany submittal. Box H-422, The Oil and Gas Journal, Tulsa, Oklahoma.

MAP STICKS

KRAFTBILT ALL-PLASTIC SNAP-ON MAP STICKS: Light-weight resilient plastic clips snap maps to sticks in seconds—eliminate rolled map-handling problems. Bright colored Index Flags—plugged in one end of sticks, carry labeled identity and instantly "flag" the maps you want. Send for Catalog 352-A. Ross-Martin Co., P.O. Box 800-A, Tulsa, Okla.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

ROYALTIES

WANTED PRODUCTION or Producing Royalties, Oil or Gas. From Principal to Purchaser. Submit full particulars, payments, engineering reports, etc. Box H-455, The Oil and Gas Journal, Tulsa, Oklahoma.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

120 ACRES WITH OIL ROYALTY—2 good houses, other good buildings, recently repaired and painted; 3 acre lake, stocked. Property partly under waterflood. Income from rent $600 year; income from oil $2200. Should increase. Price only $18,000. Clarence Coffmen, Wellsville, Kansas.

OFFERING CHOICE PRODUCING oil income royalties with large reserves per Dollar investments. A. S. Berry, 522 Wright Bldg., Tulsa, Okla.

LEASE AND DRILLING BLOCKS

SOME CLOSE IN Leases. Excellent Possibilities, Fair Dealing. If you have some Tax Money write Box 104, Carmi, Ill.

SEE A. L. BOWLES, Box 947, Ada, Okla., for drilling deals and producing royalties if you have the cash for Oil Investments.

WILL BUY 1/8 interest in 7/8 drill deal on dry hole basis. Must be good. Geo., Texas, Okla., New Mexico, Wyoming. Box 22, Emmaus, Pa.

2000 ACRES OF LEASE in old Somerset Field of Atascosa County, Texas. Thirty feet of sand. Low withdrawal to date. High residual in place. Good possibilities for secondary recovery. 1500' depth. Texas Drillers, Inc., P. O. Box 948, Seguin, Texas.

FOR LEASE: 9 acre tract of land located at the edge of Peoria, Illinois. This property is located on a railroad and good highway. Zoned for heavy industry, will lease part or all of this tract. Box H-468, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION DEAL, New Pool, Well drilled, Schlumberger log, two oil sands, 1480-1820, 640 acre block. Need operator to finish well and drill block. Or $8000 tax money and will set pipe and in tanks. Box 106, Seminole, Oklahoma, Phone 1258.

RECENTLY ORGANIZED group seeking drilling deals accompanied by complete geological reports. Box H-423, The Oil and Gas Journal, Tulsa, Oklahoma.

Will pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

KANSAS WATER FLOOD oil lease for sale, has 1200 acres, five wells plus water wells, Gaso pressure pump, tanks and other equipment, owner Mr. O'Chamis, Tioga Hotel, Chanute, Kansas.

SEMI-PROVEN SHALLOW production in Wyoming. Several 320 acre parcels @ $12.50 per acre. Long term leases. Lube type Crude. Water, electricity, roads on property, three miles from Newcastle. Well depths from 40' to 1000', easy to produce, good geology and engineering data. Box H-475, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES

Producing and Nonproducing Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY

6635 Delmar Ave., St. Louis, Mo.

BUSINESS OPPORTUNITY

FOR SALE: Well established oil field service company. Best equipment, protected territory, room for expansion. Total price $55,000. Inspection invited. S. F. Exum, Realtor, 1710 McGregor, Phone 2-3953, Wichita Falls, Texas.

Business Opportunity

We have 8500-foot rig in excellent condition, Ideco No. 709, now drilling first of eight consecutive wells in proven area. Will sell rig priced right and in addition give balance of eight consecutive contracts on profitable basis. Address reply to Box H-457, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITY

YOUNG EXECUTIVE has capital to invest in small aggressive independent oil producing or royalty company with growth potential in which his active participation is required. Sales and management experience. Oil and metals background. Box H-473, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL & GAS CO.

Near major Alabama city, two beautiful stations in two locations. Pumps 1½ million gals. gas per year, adding up to a $324,000 in total sales volume. Acreage, trucks and all inventory, which includes excellent fixtures and equipment. Established 8 years, nets $35,000 annually. Going at a price that will be hard to beat. Ask for K-4121.

ellsworth BOND & CO., Inc.
61 Madison Bldg., Memphis, Tenn.

NATIONALLY KNOWN

MANUFACTURE and DISTRIBUTING COMPANY

Selling to manufacturers, Oil Industry, Farm and Home QUALITY COATINGS, PAINTS and CHEMICALS.

Located near St. Louis, Missouri. Factory and large additional factory space on main line of leading railroads.

FOR SALE

Or will combine with responsible company fast growing business and illness forces a change. For further information CONTACT

L. M. Jennings, Representative
Box 402, Centralia, Illinois

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that 152.53 acres of land within the known geologic structure of the Greybull field, undefined, Big Horn County, Wyoming will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., November 10, 1954, when bids will be opened. Details of the lease offering, description of the lands, how and where to submit bids, and bid forms may be obtained from the Manager of the Land Office, Cheyenne, Wyoming, or from the Director, Bureau of Land Management, Washington 25, D. C. L. E. Hoffman, Minerals Officer.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that 128.63 acres of land within the known Geologic structure of the Thornburg Field, Moffat County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., November 17, 1954, when bids will be opened. Details of the lease offering, description of the lands, how and where to submit bids, and bid forms, may be obtained from the Manager of the Land Office, Denver, Colorado, or from the Director, Bureau of Land Management, Washington 25, D. C. L. E. Hoffman, Minerals Officer.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that two parcels of land containing 397.19 acres within the known geologic structure of Spring Creek Field in Park County, Wyoming, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., November 3, 1954, when the bids will be opened. Details of the lease offering, description of the lands, how and where to submit bids, and bid forms may be obtained from the Manager of the Land Office, Cheyenne, Wyoming, or from the Director, Bureau of Land Management, Washington 25, D. C. L. E. Hoffman, Minerals Officer.

WILDCAT COMPLETIONS

(Continued from page 185)

SW SW NE 7-3n-7w. IPF 300 BOPD, Noble Olson 3,480-98 ft., 29°, ⅜-in. TD 3,697 ft. (Oil discovery.)

Pace Petroleum Co. 1 Paukune, NW SW NE 36-7n-8w. Dry. TD 2,581 ft.

Greer County: Huval & Dunigan 1 Stockesbury, NW NE NW 13-6n-21w. Dry. TD 845 ft.

Jackson County: Taylor 1 Phillips, NE NE SW 5-1n-20w. Dry. TD 1,332 ft.

Kay County: Union Oil Co. of California 1 Stalnaker, SW SE SW 20-29n-2e. Dry. TD 3,903 ft.

Noble County: T. N. Berry Co. 1 Browden, SW SW NW 28-21n-2w. IPP 7 BOPD, Misener sand 5,171-75 ft., 41°. TD 5,175 ft. (Oil discovery.)

Osage County: L. E. Cox 1 Osage, SW SW NE 5-26n-7e. Dry. TD 2,961 ft.

Sunray Oil Corp. 10 Osage, NW NE NE 23-24n-10e. IPP 6 BOPD, Bartlesville sand 1,892-1,808 ft., 38°. TD 2,257 ft. (Geological wildcat discovery in West Barnsdall.)

Service Drilling Co.-Wilcox Oil Co. 1 Drum, NW NW NE 5-25n-7e. Dry. TD 2,810 ft.

Sinclair Oil & Gas Co. 1 Tract 298, SE SW SE 15-26n-5e. Dry. TD 3,020 ft.

Pawnee County: Davon Oil & Gas Co. 1 Burns, NW SW NE 6-22n-5e. Dry. TD 3,352 ft.

Texas County: Oceanic Oil Co. 1 Swinger "A," C NW NE 5-5n-16eCM. IPP 20 BOPD, Morrow 5,360-68 ft., 26.6°. TD 6,991 ft. (Oil discovery in Hugoton field.)

Washington County: Robert Little et al 1 Todd, SE SE SW NW 4-23n-13e. Dry. TD 1,655 ft.

Barbara Oil Co. F-10 Gibson, NW SW NE 22-28n-13e. Oil well from water flood in Bartlesville sand. TD 1,886 ft. Discovery in Bartlesville-Dewey field.)

KANSAS

Barber County: M. B. Armer 1 Groendyke, SE SE NE 5-34s-11w. Dry. TD 4,650 ft.

Ellis County: Cook & Galloway 1 Werth, SE SE NE 33-15s-18w. Dry. TD 3,546 ft.

Graham County: Leo Wentworth Oil Co. 1 Walts, SW SW SW 10-8s-25w. IPP 175 BOPD, Lansing-Kansas City 3-867-72 ft. TD 3,965 ft. (Opens Northeast Schmeid pool.)

Swenson-Anschutz 1 Clark, SE SE NW 5-8s-23w. Dry. TD 3,995 ft.

McPherson County: Dozier 1 Sand, NE NE NW 9-18s-2w. Dry. TD 3,695 ft.

Pawnee County: J. J. Lynn 1 McClaren, SE SE NE 27-23s-18w. Dry. TD 4,495 ft.

N.C.R.A. 1 Ekert, NW NW NW 18-20s-19w. IPP 91 BOPD, Cherokee 4,223-25 ft. TD 4,300 ft. (Opens East Shiley pool.)

Atlantic Refining Co. 1 Smith, NW NW SW 3-23s-15w. IPP 196 BOPD, Simpson 4,023-37 ft. TD 4,088 ft. (Opens Jay pool.)

L. C. Knight Drilling Co.-N.C.R.A. 1 J. Hutchinson estate, NW NW NW 3-23s-17w. IPF 1,413 BOPD, Mississippian 4,150-58 ft. TD 4,409 ft. (Opens Northeast Garfield pool.)

Rooks County: Alkay Oil Co. 1 Houston, NE NE NW 12-8s-17w. Dry. TD 3,436 ft.

Harold Patton 1 Fike, NW NW SE 5-9s-17w. IPP 203 BOPD, Lansing-Kansas City 3,336-40 ft. TD 3,475 ft. (Opens Sutheast Dopita pool.)

Sumner County: Adair Oil Co. 1 Shobe, NW NW NE 29-33s-4w. Dry. TD 4,576 ft.

Copitt Drilling, Inc. 1 Schifferdecker, SE SE NE 20-34s-2e. IPP 7 BOPD, Mississippian 3,521-32 ft. TD 3,532 ft. (Opens East Ashton pool.)

Trego County: Heathmen & Seeligson 1 Unrein, SW SW NE 34-15s-21w. Dry. TD 4,338 ft.

NEBRASKA

Cheyenne County: Calstar Petroleum 1 Schaaf-SP, SW SW NE 21-13n-53w. Dry. TD 5,825 ft.

Eddie Fisher 1 Schreiner, SW SW SE 20-16n-52w. Dry. TD 5,780 ft. Lakota.

New Drilling Co. 1 Smith, SE SE SW 30-16n-52w. Dry. TD 5,568 ft.

Rex Petroleum Co. 1 Holt, SE SE SE 10-16n-51w. Dry. TD 5,140 ft.

Kimball County: Nebraska Drillers 1 State, NE NE SE 36-14n-56w. Dry. TD 6,601 ft.

NORTH DAKOTA

Pierce County: Mobil-Producing F-12-8-P Fleck, SW NW 8-158n-72w. Dry. TD 2,990 ft. Lodgepole.

Shell 1 Joseph Bacher, NW NE 3-158n-70w. Dry. TD 2,875 ft. Devonian.

CALIFORNIA

Fresno County: T & T Oil Co. and Santa Fe Drilling 8-24 Guijarral, 24-20s-16e. Dry. TD 10,319 ft.

Kern County: Pacific Western Oil Corp. 17A-31 M-M B, 31-30s-22e. Dry. TD 8,673 ft.

Tide Water Associated Oil Co. 84 "Well," NE NW 16-30s-21e, IPF 387 BOPD, 18/64-in. choke, 38.5° gravity, 136 M.c.f. gas, perfs. 2,970-77 ft., TD 3,088 ft. (About ¼-mile northwest extension to Oceanic pool at Belgian Anticline field.)

Kings County: Brookline Oil Co. 4 Travma, 8-24s-18e. Dry. TD 1,062 ft.

Kern County: Palomar Oil & Refining Co. 1 Kane-Intex, 30-27s-27e. Dry. TD 2,910 ft.

Los Angeles County: Oceanic Oil Co. 1 Woodley-Compton, 21-3s-13w. Dry. TD 4,040 ft.

Sacramento County: The Texas Co. 1 Georgiana Unit, SW SW 10-4n-4e, IPF 1,700 M.c.f. gas, ¼-in. choke, 1,110 tubing pressure, perfs. 3,495-3,935 ft., TD 4,300 ft. (New zone discovery, upper Domengine sand, in Georgiana Slough field.)

San Benito County: Tide Water Associated Oil Co. 3 Breen, 19-12s-5e. Dry. TD 4,039 ft.

Ventura County: Clifford I. Miller 1 Reichenbach, 21-5n-18w. Dry. TD 3,699 ft.

Shell Oil Co. 1 Van Couvering, 15-3n-20w. Dry. TD 7,003 ft.

Yolo County: D. D. Feldman Oil & Gas 1 Otto E. Bruhn, 6-8n-3e. Dry. TD 7,515 ft.

Western Gulf Oil Co. 1 L. M. Bemmerly, 36-11n-1w. Dry. TD 4,000 ft.

MONTANA

Carbon County, Clarks Fork: J. Ray McDermott 1 Unit, SE SW NW 27-9s-22e. IPF 248 BOPD, Basal Frontier discovery, new pay. TD 8,029 ft. Morrison.

Fallon County, MDU area: Shell Oil Co. 14-34 Unit, C SW SW 34-5n-61e. IPP 209 BOPD, Red River discovery, new field. TD 8,471 ft. Red River.

Hill County, Cottonwood area: DeKalb-Northern Oil Division 1 Larson, C NE NE 17-35n-13e. Dry. TD 4,027 ft. Madison.

Rosebud County, North Porcupine: Phillips Petroleum Co. 4 Porcupine, C NE SE 31-12n-39e. Dry. TD 3,196 ft. Otter.

WYOMING

Fremont County, Kirk Unit: Sinclair Oil & Gas Unit, NW NW NW 8-28n-92w. IPP 30 BOPD, 28.8°, Phosphoria discovery, new field. TD 8,465 ft. Tensleep.

Niobrara County, Corral Unit: Buck Creek Oil Co. 1 Unit, E½ SE NE 17-36n-60w. Dry. TD 2,156 ft. Morrison.

Uinta County, Stove Creek area: Stove Creek Oil Co. 4 UPRR, SE SE NE 27-14n-119w. Dry. TD 1,587 ft. Frontier.

Washakie County, Southeast Neiber Dome: The California Co. 8 Unit, NW NW NE 30-45n-91w. IPF 246 BOPD, Tensleep discovery, new field. TD 10,546 ft. Tensleep.

WASHINGTON

Continental Oil Co. 1 Wishkah, 1-18n-9w. Dry. TD 4,248 ft.

COLORADO

Gem Oil Co. 1 Pavel-Slossar, NW NW NW 35-1s-58w. Dry. TD 6,086 ft.

Baca County: Pure Oil Co. 1 Teeter, C NE NE 26-30s-44w. Dry. TD 6,311 ft. Arbuckle.

Larimer County: Ryan & Davis 1 Cain, C SW SW 30-7n-52w. Dry. TD 4,631 ft.

Sure Oil Co. 1 Alps, SE SE SE 19-5n-69w. Dry. TD 2,265 ft. Lyons.

Wytex Service Corp. 1 Propst, C SW NW 26-6n-53w. Dry. TD 4,755 ft.

Logan County: Gem Oil Co. 1 Huffman et al, NE NE NW 24-9n-55w. Dry. TD 5,645 ft.

Halbert & Jennings and Fallon Gas Corp. and New World Oil Co. 2 Nelson, SW SW SW 26-12n-53w. Dry. TD 5,450 ft.

McMahon and Bullington and Halbert & Jennings 1 Mentgen Trustee, C NE SE 23-9n-53w. Dry. TD 4,928 ft.

Morgan County: H. C. Arnold and Calvert 1 Groves, C NE NE 8-5n-60w. Dry. TD 6,607 ft.

Falcon Seaboard 1 Challis, C SW SE 28-4n-59w. Dry. TD 6,210 ft.

Petroleum, Inc. 1 Orth, SW SW SW 30-2n-58w. Dry. TD 6,160 ft.

Wytex Service and W. R. Campbell 1 Gamble, SW SW SW 27-1n-57w. Dry. TD 5,620 ft.

Washington County: Amerada Petroleum Corp. 1 McFall, C NE SW 7-1s-55w. Dry. TD 5,252 ft.

Weld County: Midland Oil Co. and King Bros. 1 UP, C SE NE 33-1n-61w. Dry. TD 6,853 ft.

The Texas Crude Oil Co. 1-A Cox, SW NW SW 5-11n-64w. Dry. TD 10,200 ft. ft. Lyons.

MANITOBA

Sapphire 9-5 Northwest Daly, LSD 9, 5-11-28w1. Dry. TD 2,776 ft.

Dome-Harris-Cox 4-12 South Two Creeks, LSD 4, 12-12-27w1. Dry. TD 2,330 ft.

SASKATCHEWAN

British-American-Husky-Phillips 12-11 Bemersyde, LSD 12, 11-12-8w2. Dry. TD 3,847 ft.

Hudson's Bay-Tide Water 8 Chaplin Lake, LSD 5, 11-19-9w3. Dry. TD 3,520 ft.

Socony-Woodley-Southern 21-8 South Illerbrun, LSD 8, 21-10-18w3. Jurassic oil well. TD 4,644 ft.

Tide Water 3 Kenosee Crown, LSD 5, 15-10-5w2. Dry. TD 4,545 ft.

Tide Water 3 White Bear Crown, LSD 3, 12-9-3w2. Dry. TD 4,450 ft.

ALBERTA

Anglo Union Kroy 24-7 Carbon, LSD 7, 24-29-24w4. Dry. TD 6,511 ft.

Cal Standard 4 Grassy Island Lake, LSD 11, 10-31-6w4. Dry. TD 3,351 ft.

Union 1-27 Nestow, LSD 1, 27-60-24w4. D3 Oil well. TD 3,494 ft.

Imperial 9-6-52-11 Cynthia, LSD 9, 6-52-11w5. Dry. TD 10,217 ft.

Baysel-Charter 11-32 Twelve Mile Creek, LSD 11, 32-15-12w4. Bow Island gas well. TD 2,410 ft.

ILLINOIS

A rank wildcat in Moultrie County, 7 miles northwest of Sullivan, has found 3 possible pays 22 miles from production. It is Lloyd Younger, Jr. and Associates 1 Fulk, SW NW 10-14n-4e.

INDIANA

In Sullivan County 5 miles south of Sullivan Gus and Bob Lowry 1 Mason, SE SW 27-7n-9w, is going ahead to the Devonian after a 2-hour drill-stem test of the Warsaw at 1,856-65 ft. got 810 ft. of clean oil, 420 ft. of mud-cut oil. The strike is an indicated new pay for the area.

In Posey County 12 miles south of Mount Vernon Ralph C. Halbert 1 Hanshoe, NE NW 35-8s-14w, got 480 ft. of oil on a drill-stem test of the Aux Vases at 2,699-2,710 ft. This wildcat is more than 1 mile from other wells.

Five miles west of Oakland City in Gibson County O. W. Mayhew and Dr. Miller 1 Fritz, SE NW 17-2s-9w, made 5½ bbl of oil hourly on swab from the Benoist at 1,642-53 ft. Nearest comparable pay is 2 miles away.

WESTERN KENTUCKY

Walter C. Cook, Jr. and Associates 1 Pritchett, 21-P-21, 3 miles northwest of Corydon, flowed 700 bbl. of oil per day natural from the O'Hara lime at 2,518-26 ft.

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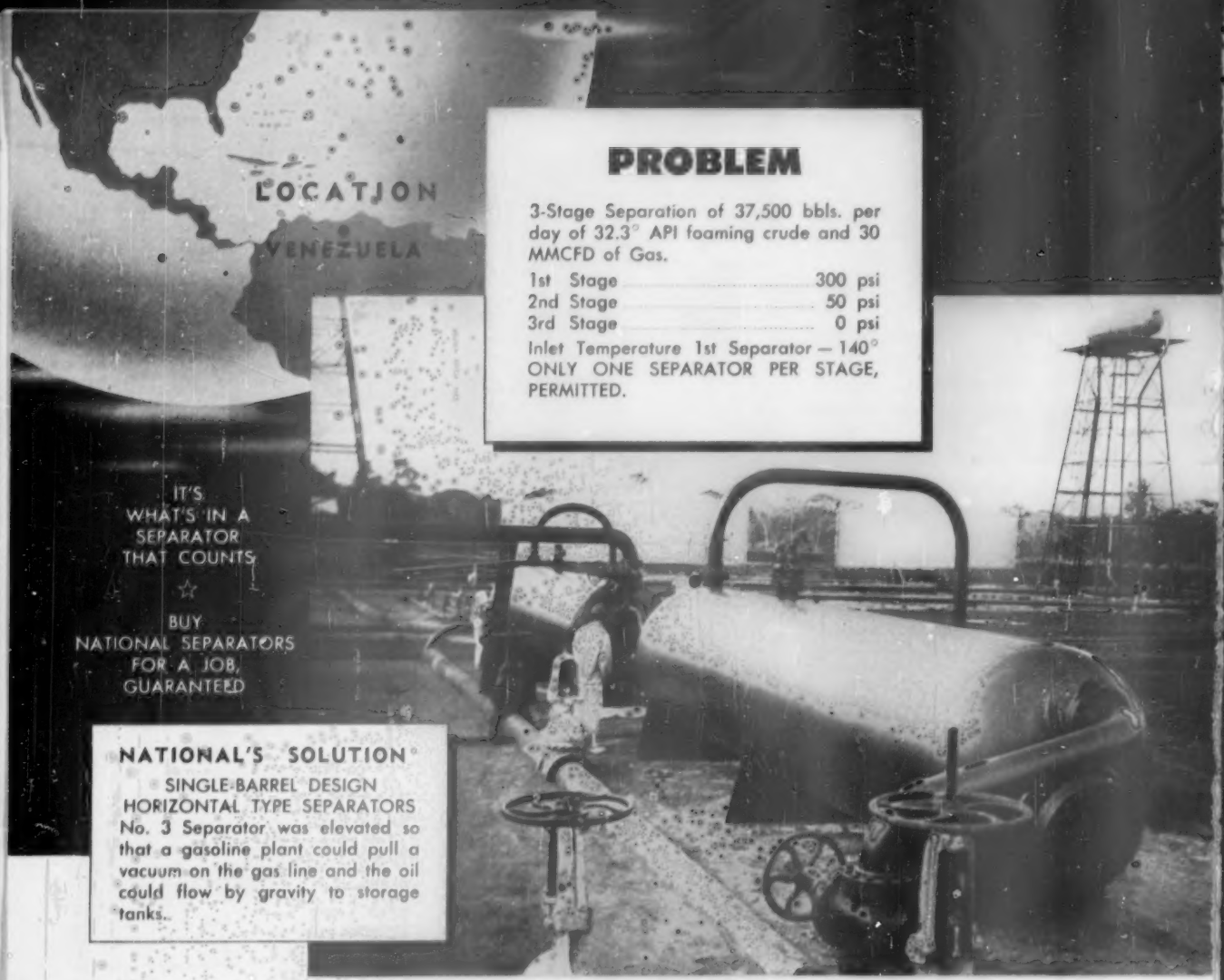

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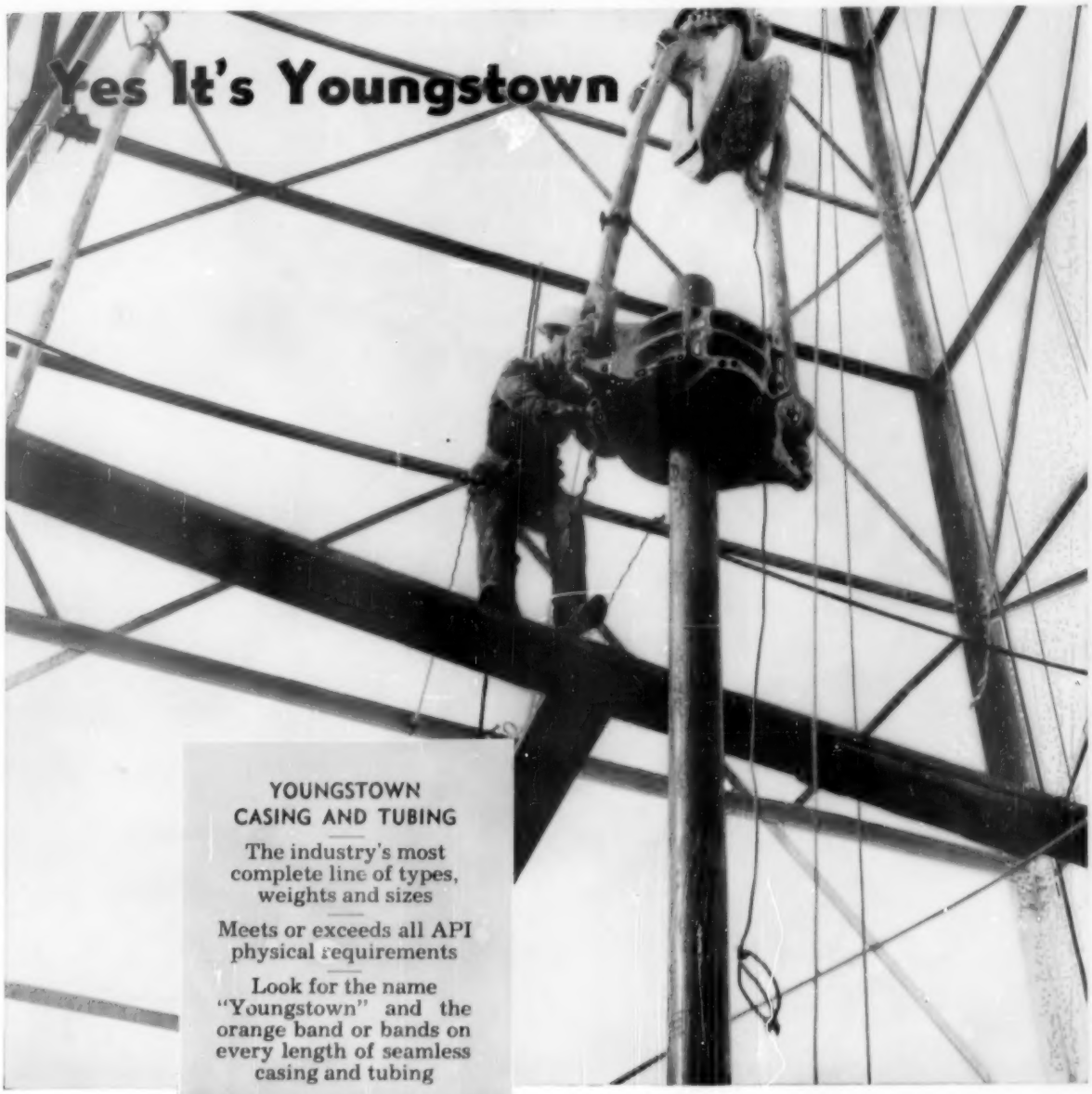

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